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C. A. B.
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Plant Breeding Abstracts
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STATISTICS

1095 Scheffé, H.
Alternative models for the analysis of variance.
Ann. math. Statist. 1956 : **27** : 251–71.

An account is given of the various models that have been proposed for a two-way classification situation, and their methods of analysis. Fixed effect, random effect, mixed and randomization models are discussed. Particular attention is paid to the nature of the interaction. A bibliography is included.

1096 Welch, B. L.
On linear combinations of several variances.
J. Amer. statist. Ass. 1956 : **51** : 132–48.

The general problem considered in this paper is, given estimates s_i^2 of variances σ_i^2 with s_i^2/σ_i^2 distributed as χ^2/f_i with f_i degrees of freedom, how to find confidence intervals for $V = \lambda_1\sigma_1^2 + \lambda_2\sigma_2^2 + \dots + \lambda_k\sigma_k^2$, where the λ_is are known constants. The main application is to the estimation of variance components. The author considers two cases, (i) where the λ_is are all of the same sign, and (ii) where they are not. Approximations for large samples are given and a large part of the paper contains improvements to these approximations, enabling them to be used in small samples. A numerical illustration is included.

1097 David, H. A.
The ranking of variances in normal populations.
J. Amer. statist. Ass. 1956 : **51** : 621–26.

Two procedures for ranking variances of normal populations are considered. The first is essentially a gap test and effects a separation of the variances into two groups whenever the ratio of successive mean squares, arranged in ascending order of magnitude, exceeds a critical tabulated value. The second method is a more elaborate multiple decision procedure based on the distribution of the maximum *F*-ratio.

1098 de la Garza, A.
Quadratic extrapolation and a related test of hypotheses.
J. Amer. statist. Ass. 1956 : **51** : 644–49.

The paper is concerned with quadratic regression of a variable y on an independent variable x, and the problem discussed is how to choose values of x in a given range (a, b) to obtain maximum efficiency in estimating the value of y at some $x = c > b$, on the basis of n observations of x and y. It is shown that observations should only be made at $x = a$, $\frac{1}{2}(a + b)$ and b and the proportions at each of the three values are determined.

1099 Masuyama, M. & Hatamura, M.
Recent advances in biometry in Japan.
Biometrics 1956 : **12** : 499–61.

The following topics are discussed: general theory; design of agricultural experiments; bioassay; population genetics; ecology; forestry; and fisheries. An extensive bibliography is included.

1100 Kramer, C. Y.
Extension of multiple range tests to group correlated adjusted means.
Biometrics 1957 : **13** : 13–18.

An extension of the method of Duncan [cf. XXVI, 800]* is made to means obtained from covariance analyses, and incomplete block, lattice and partially balanced designs.

1101 Jackson, J. E. & Fleckenstein, M.
An evaluation of some statistical techniques used in the analysis of paired comparison data.
Biometrics 1957 : **13** : 51–64.

A useful discussion of the available methods is given, illustrated by an example.

1102 Duncan, D. B.
Multiple range tests for correlated and heteroscedastic means.
Biometrics 1957 : **13** : 164–76.

The author extends his rule for judging the significance of the differences between the means in a set of means to the situation where the means have different variances or are correlated. Two examples are given, one for unequally replicated means and another for a 5 x 5 lattice. A short-cut applicable when the number of means is large is described. The significance levels and powers of the procedures are briefly considered.

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

1103 WANG, C.-M.
(The problem of comparing two samples).
Taiwan Ta-hsueh Nung-hsueh-yuan Chuan-Kan/Spec. Publ. Taiwan Univ. Coll. Agric. 1956 : No. 2 : Pp. 30.

A mathematical study is made of modifications of the *t* test that have been proposed to allow for nonnormal variates and unequal variances of the samples.

1104 HUANG, C.
(Balanced incomplete block experiments. I).
Nung-lin-hsueh Pao/J. agric. For. Taichung 1955 : **4** : 241–60. [Chinese].

The author makes some criticisms of the analyses of incomplete block designs published by Yates [VII, 1092]. He concludes that although Yates's estimates for the sum of squares for varieties and for the sum of squares for blocks are incorrect the total expectation for blocks and varieties combined is correctly obtained.

1105 DAS, M. N.
Latin squares with several missing plots.
J. Indian Soc. agric. Statist. 1955 (1957) : **7** : 46–56.

An exact method for the analysis of a Latin square is given when either (1) the number of missing plots is less than the size of the square and each belongs to a different row, column and treatment, or (2) a row, column or a treatment is partly, but not completely, missing. An example of the first type is included.

1106 DAS, M. N.
Missing plots in partially balanced and other incomplete block designs.
J. Indian Soc. agric. Statist. 1955 (1957) : **7** : 111–26.

General expressions are given for estimates of missing values and the variance of treatment differences, when two observations are missing in an incomplete block design, Youden square, square lattice with replications and partially balanced incomplete block. An example of the last type is included.

1107 SPROTT, D. A.
A note on combined interblock and intrablock estimation in incomplete block designs.
Ann. math. Statist. 1956 : **27** : 633–41.

It is shown that the usual estimate of treatment effect formed by combining the interblock and intrablock estimates, intuitively derived by Yates, is not the best method for some designs. The correct method is that described by Cochran and Cox.

1108 BAINBRIDGE, J. R., GRANT, A. M. & RADOK, U.
Tabular analysis of factorial experiments and the use of punch cards.
J. Amer. statist. Ass. 1956 : **51** : 149–58.

An extension of Yates's method of analysis of a factorial experiment into individual degrees of freedom is described and illustrated by a 3 x 2 x 4 experiment.

1109 TAYLOR, W. B.
Incomplete block designs with row balance and recovery of interblock information.
Biometrics 1957 : **13** : 1–12.

Consider a balanced incomplete block design with the blocks thought of as "columns". In some circumstances there may be systematic effects due to "rows" and a design, such as a Youden square, may be used in which the row effect may be conveniently eliminated. Smith and Hartley have discussed the case where the number of replicates is a multiple of the block size. In the present paper the general case is considered: it is stated that designs with certain partial row balance are available. Their analysis, with and without recovery of interblock information, is described and illustrated by an example.

1110 SMITH, H. F.
Missing plot estimates.
Biometrics 1957 : **13** : 115–18.

A discussion of the standard error of the estimate of a missing yield is presented.

1111 KRAMER, C. Y. & BRADLEY, R. A.
Examples of intra-block analysis for factorials in group divisible, partially balanced, incomplete block designs.
Biometrics 1957 : **13** : 197–224.

In a group divisible, partially balanced, incomplete block design, the total number of treatments is $v = mn$, and each treatment has $(n - 1)$ first associates and $n(m - 1)$ second associates. The authors suggest the possibility that the v treatments might be the mn levels of a factorial experiment with two factors at m and n levels respectively. The principal properties of these designs for varieties are summarized and the superposition of the factorial feature discussed. Two examples are given: the first has $v = 8$, $r = 3$, $k = 4$, $b = 6$, $m = 4$, $n = 2$, $\lambda_1 = 3$, $\lambda_2 = 1$ and the analyses for (i)

4 x 2 (ii) 2^3 and (iii) $\frac{1}{2}$-replicate of a 2^4 factorial designs are described. The second has $v = 12$, $r = 4$, $k = 3$, $b = 16$, $m = 3$, $n = 4$, $\lambda_1 = 0$, $\lambda_2 = 1$ and belongs to a sub-class called "near-balanced". The analyses are given for (i) 3 x 4 and (ii) 3 x 2^2 factorial designs. The adjusted treatment sums of squares are obtained as functions of the treatment-effect estimators in the factorial method. Only intrablock information is considered.

1112 Govinda Iyer, T. A.
Quicker methods in the analysis of variance.
Madras agric. J. 1957 : **44** : 326–36.

The use of methods based on range instead of analysis of variance for analysing completely randomized and randomized-block layouts is exemplified.

1113 Sváb, J.
A varianciaanalizis megközelítése négyzetreemelés nélkül különös tekintettel blokkelrendezésű szántóföldi kísérletek értékelésére. **(A method requiring no squaring approximating to analysis of variance, with special reference to the evaluation of block-design field trials).**
Növénytermelés 1957 : **6** : 77–90.

A procedure for deriving s_d and F values approximating to those obtained by analysis of variance is described. The method, which is based on the relation $\sqrt{\frac{\pi}{2}}$ between standard deviation and mean deviation, requires no squaring and is applicable only to two-fold classification tables. An example of the procedure is presented and tables showing the differences between the values obtained by the present and by the usual method are included.

1114 Schnell, L. (Mrs.)
Hozzászólás Horváth Alajos és Sváb János dolgozatához. **(Remarks on the work of Alajos Horváth and János Sváb).**
Növénytermelés 1956 : **5** : 367–72.

Horváth, A. & Sváb, J.
Megjegyzések Schnell Lászlóné "Hozzászólásához". **(Comments on Mrs. László Schnell's remarks).**
Ibid. 1956 : **5** : p. 372.

The first author criticizes a method of field trial evaluation developed by the other two authors [cf. XXVI, 2973], who reply that her objections have been met in their later work [cf. XXVII, 2597].

1115 Tsan, W.-L.
(The theory and practice of the multivarietal randomized arrangement pairing method).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 103–22. [Chinese].

A method of designing and analysing field trials is described which combines the pairing method commonly used in China with the randomized designs in standard use elsewhere.

1116 Calzada Benza, J.
El error experimental y la precisión en los experimentos. **(The experimental error and the precision of experiments).**
Bol. Estac. exp. agríc. La Molina 1957 : No. 67 : Pp. 33. (Mimeographed).

The effects of the following factors on the size of the experimental error are discussed: type of design, shape and size of plot, relation between layout and fertility gradients, missing plants and border effects.

1117 Nair, K. R.
Simplified analysis of singly linked blocks.
Biometrics 1956 : **12** : 369–80.

Singly linked blocks are special cases of partially balanced incomplete blocks with two associate classes, being duals of balanced incomplete blocks with $\lambda = 1$. The analysis is described and illustrated by an experiment on the comparisons of the yields of 35 varieties of oats in an experiment in 15 blocks of 7 plots.

1118 Finney, D. J. & Cope, F. W.
The statistical analysis of a complex experiment involving unintentional constraints.
Biometrics 1956 : **12** : 345–68.

Due to particular circumstances, a 2 x 4^2 factorial experiment on the effects of spacing, mulch and clone on the yield of cacao, designed in the form of two replicates of the 32 treatment combinations with some partial confounding, had certain nonorthogonal column constraints imposed upon it. The authors describe the analysis, firstly ignoring the latter but incorporating the partial confounding, and secondly allowing for the column constraints using the method of fitting constants, formally identical with multiple regression.

GENETICS

1119 STERN, C.
The scope of genetics.
Proc. nat. Acad. Sci. USA 1957 : **43** : 744–49.

The text is given of the introduction to a symposium on genetics held at the 94th annual meeting of the National Academy of Sciences in Washington, DC, 15 April 1957. After commenting on early definitions of the units of inheritance and on the progress made during the last decade in defining genic material in chemical terms, the author discussed the significance of genetics in the study of the fundamental problems of biology as a whole, embryology, evolution, animal behaviour and other fields.

1120 HARBERD, D. J.
The within population variance in genecological trials.
New Phytol. 1957 : **56** : 269–80.

The results are given and discussed of an experiment designed to investigate the relative importance of the genetic and nongenetic parts of the within population variance, using populations of *Festuca ovina* from a number of localities in England. Significant differences were found within populations in respect of five characters studied and it is suggested that at least 50% of the within population variance is of genetic origin. In respect of nongenetic variance nonuniformity of the trial ground is of greater importance than errors of recording.

1121 LEDERBERG, J.
Viruses, genes and cells.
Bact. Rev. 1957 : **21** : 133–39.

The topics discussed in this brief review include the selective effect of drugs and other chemicals on bacterial populations, chemical mutagenesis and phage transduction and their bearing on genetic analysis.

1122 ROBSON, D. S.
Some biometrical formulae for the analysis of quantitative inheritance systems involving two haploid or inbred diploid parents.
Genetics 1957 : **42** : 487–98.

"Formulas are given which show some of the theoretic relationships among the phenotypic frequency distributions in a backcrossing and selfing system involving two haploid or homozygous diploid parents. A device used in obtaining the formulas is the partitioning of the collection of all possible genotypes into subsets such that in any population derived by the breeding system every genotype appears with the same theoretic relative frequency."
[from Author's summary]

1123 ROBSON, D. S.
Applications of the k_4 statistic to genetic variance component analyses.
Biometrics 1956 : **12** : 433–44.

The applications are to the unbiased estimation of the variance of estimates of variance components, and to the estimation of the number of genes or factors controlling the inheritance of a quantitative character under the additive model with dominance.

1124 VAN DER VEEN, J. H.
The heritable variance of F_1 x F_2 progeny means.
Biometrics 1957 : **13** : 111–12.

Using Mather's notation, the above variance for two loci is $\frac{1}{8}d_a^2 + \frac{1}{8}d_b^2 + \frac{1}{64}i^2_{ab|}$, which includes terms in d^2 and i^2 only. For n loci, the approximation $\frac{1}{8}\sum_i d_i^2 + \frac{1}{64}\sum_{ij} i_{ij}^2$ can be used.

1125 OPSAHL, B.
The discrimination of interactions and linkage in continuous variation.
Biometrics 1956 : **12** : 415–32.

Mather's partitioning method is extended to cover F_1 x F_2 and F_1 x P crosses. To illustrate the analysis, the inheritance of height and flowering time was studied in the P, F_1, F_2, F_3, F_1 x F_2 and F_2 x P generations of a *Nicotiana rustica* cross. The inheritance of height appeared to depend on additive genetic and dominance components only. In the case of flowering time, nonallelic interactions were detected but whether, in addition, linkage effects were involved could not be decided definitely from the statistics available.

1126 HAYMAN, B. I.
Interaction, heterosis and diallel crosses.
Genetics 1957 : **42** : 336–55.

A graphical method has been devised in which the apparent dominance in a series of diallel crosses is plotted against the epistatic deviation. Such graphs are used to ascertain the relationship between epistasis and heterosis in diallel data relating to *Nicotiana rustica*, maize and cotton. A direct relation between epistasis and heterosis was only found in the maize material where selection for heterosis had been practised. The method described here is compared with the method of diallel analysis developed in a series of papers by Jinks and Hayman [cf. XXV, 2625; XXV, 2624; XXVI, 828 and XXVII, 1011].

In the final discussion, the light thrown by the analysis on the nature of combining ability and the value of selecting for complementary epistasis and against duplicate epistasis is assessed.

1127 LEDERBERG, J.
Sibling recombinants in zygote pedigrees of *Escherichia coli*.
Proc. nat. Acad. Sci. USA 1957 : **43** : 1060–65.

"Individual mating pairs were isolated from highly fertile matings of *E. coli*, *Hfr* x *F*. All the recombinants were found in the progeny of the *F* exconjugant, which is therefore designated as ♀. The segregation of markers in the cell lineage indicated (1) the loss of certain chromosome segments, before or after fertilization or both; (2) coincidence of crossing over, suggestive of sporadic pairing; (3) possible correlation of reciprocal crossovers; (4) recycling of meiosis; and (5) an interval of nuclear assortment from a temporary heterokaryon."

[Author's summary].

1128 ALIKHANIAN, S. I. & MINDLIN, S. Z.
Recombinations in *Streptomyces rimosus*.
Nature, Lond. 1957 : **180** : 1208–09.

In investigations at the USSR Antibiotics Research Institute, Moscow, prototrophic colonies were obtained from five out of 15 combinations of biochemical mutants of *S. rimosus*. Several types of prototrophic colonies differing in morphological characters and antibiotic activity appeared in all of the three combinations studied further. The stability of the prototrophic colonies in successive transfers was investigated in combinations 8229–310 (requiring valine and isoleucine) + 8229–1361 (requiring threonine). Two types of prototrophs regularly produced 3–4% of auxotrophic segregates throughout several generations. These auxotrophs all required threonine, none showing the requirements of parent 8229–310. The auxotrophs differed morphologically from the parent mutant 8229–1361.

1129 WALLACE, M. E.
The use of affinity in chromosome mapping.
Biometrics 1957 : **13** : 98–110.

Further evidence is provided for the phenomenon of affinity [cf. XXIV, 11] in the house mouse and it is shown how quasilinkage data can be used for locating the centromere.

1130 JACOB, F. & WOLLMAN, E. L.
Analyse des groupes de liaison génétique de différentes souches donatrices d' *Escherichia coli* K12. **(Analysis of the genetical linkage groups of different donor cultures of *E. coli* K12).**
CR Acad. Sci., Paris 1957 : **245** : 1840–43.

In crosses of Hfr, which gives rise to a high proportion of recombinants [cf. XXVII, 59], with F^-, the same end (the origin) of the donor chromosome is always the first to penetrate the receptor cell, and since the chromosome is liable to break during conjugation, markers near the origin will recombine more frequently than markers at the distal end. Data from studies of several Hfr strains gave linkage groups which could be represented as a circle and it is suggested that the formation of an Hfr strain from an F^+ strain may be associated with a break at any point in the circle, one of the broken ends then acting as the origin and the *F* factor becoming attached to the other end. The latter supposition would account for the very low rate of *F* transmission in Hfr x F^-.

1131 TANAMI, Y.
(Studies on host-range mutations of T2 phage. I. On new linkage relations between markers controlling host range and markers controlling plaque type).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 100–08. [Japanese].

Recombination values have been determined for the host range loci h^c and h^t and the plaque-type markers *r* and *tu*.

1132 SHULT, E. E. & LINDEGREN, C. C.
The localized crossover and a new hypothesis of chromosomal interference.
Experientia 1957 : **13** : 393–94.

The occurrence of localized crossing-over extending over a definite but restricted region including several identifiable loci has been detected in *Saccharomyces* by means of tetrad analysis. Discussion of the possible mechanism involved in local crossing-over shows that it can account for the phenomenon interpreted as chromosomal interference and "makes it possible to generalize the concept of chromosomal behavior from *Ascomycetes* to *Drosophila* since it is not inconsistent with the high frequency of 2-strand double exchanges nor the negative chromosomal interference found in *Neurospora* which would have predicted high coincidence values in *Drosophila*".

1133 Luria, S. E. & Burrows, J. W.
Hybridization between *Escherichia coli* and Shigella.
J. Bact. 1957 : **74** : 461–76.

"A number of Shigella strains were tested for mating ability with *E. coli*. All the strains tested were fertile with F^+ or Hfr derivatives of *E. coli* strain K–12 and *E. coli* strain C. The Shigellas behave like F^- strains in the fertility system of *E. coli* and, like *E. coli* F^-, can be changed to the F^+ state by mixed cultivation with an F^+ culture. Matings result in formation of hybrids, which exhibit new combinations of characters typical of Shigellas with characters typical of *E. coli*. The frequency of recombination is lower than in similar crosses between strains of *E. coli* although the frequency of mating, measured by zygotic induction of prophage λ, is comparable in both types of crosses. Also, some of the characters of the *E. coli* parent fail to be transmitted to the *E. coli* x Shigella hybrids. These results suggest incomplete genetic homology between the two groups of organisms.

"Some hybrids between *E. coli* and type strains of *Shigella flexneri* possess somatic antigens closely related to those of *S. flexneri* type Y. This antigenic change is controlled by genetic factors closely linked to factors controlling lactose utilization. The results suggest a possible role of hybridization occurring in nature in the evolution of the *Enterobacteriaceae* and in the origin of aberrant and intermediate strains of enteric bacteria." [Authors' summary].

1134 Hadorn, E.
Erbkonstitution und Merkmalsbildung. (**Hereditary constitution and the formation of characters**).
Verh. schweiz. naturf. Ges. 1956 : **136** : 52–66.

The author discusses existing knowledge of gene action with special reference to enzyme controlled reactions.

1135 Fraser, D., Mahler, H. R., Shug, A. L. & Thomas, C. A. (Jun.)
The infection of sub-cellular *Escherichia coli*, strain B, with a DNA preparation from T2 bacteriophage.
Proc. nat. Acad. Sci. USA 1957 : **43** : 939–47.

A disrupted preparation of T2 obtained by treatment with concentrated urea solution was devoid of viable phage when plated, but produced T2 phage when mixed with protoplasts of *E. coli*. Evidence is given in support of the view that infection of the protoplasts by DNA had occurred. The techniques of DNA isolation and infection require improvement so that experiments on genetic recombination become possible. The behaviour of DNA from other viruses and genetically marked strains of bacteria, as well as of RNA with recognizable properties, also require investigation by this method.

1136 Chargaff, E., Schulman, H. M. & Shapiro, H. S.
Protoplasts of *E. coli* as sources and acceptors of deoxypentose nucleic acid: rehabilitation of a deficient mutant.
Nature, Lond. 1957 : **180** : 851–52.

Protoplasts of a lysine-requiring mutant were restored to the prototrophic condition by treatment with nucleic acid isolated from protoplasts of the wild type.

1137 Tsujita, M. & Matsui, C.
Studies on the lysogenicity of *Pseudomonas solanacearum* with special reference to the new type phage produced from a doubly lysogenic strain.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 113–23.

Infection of the lysogenic bacterial strain S–9 with T–c200 phage results in some doubly lysogenic bacteria. Infection of the nonlysogenic bacterial strain S–IX with both S–9 and T–c200 phages also gives rise to doubly lysogenic bacteria. In both cases, some of the doubly lysogenic bacteria liberate a phage with a new type of host range. However, the cells produced by division of such bacteria give rise only to one or other of the original phage types. Thus phage recombination appears to be restricted to the time when double lysogenicity is initiated.

1138 Freese, E.
Über die Feinstruktur des Genoms im Bereich eines *pab* locus von *Neurospora crassa*. (**The fine structure of the genome in the region of the *pab* locus of *N. crassa***).
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 388–406.

A series of crosses were made whereby the order and recombination frequencies of the genes *hist*, *inos*, *pab*, *me* and *asp* were established, it being shown that *me* involves a rather large deletion. Three distinct *pab* alleles, when crossed with *me*, all gave the same results and are regarded as being mutants of the same locus. In respect of the *inos* gene a correlation effect was observed, recombination between *inos* and *pab* being more frequent than that expected from independent crossing over; the correlation was confined to small regions of intimate pairing, the length of which is calculated as 0·05% map units. The three *pab* alleles gave no cross-feeding effects in heterocaryons and are regarded as belonging to the same cistron. Crosses involving the *pab* alleles in conjunction with the other markers enabled the linear order of the three *pab* alleles in respect to one another and to the other markers to be established. A correlation effect was observed between two *pab* alleles and the adjacent markers but not between markers on opposite sides of the *pab* region; the results again indicate the region of intimate pairing to be of the order of 0·05% units, which is calculated as corresponding to 3 x 10^3 nucleotide pairs. All the results were in consonance with the assumption that the various *pab* alleles, as well as the linked markers, were arranged in a linear order and not as side chains.

1139 Michaelis, P.
Genetische, entwicklungsgeschichtliche und cytologische Untersuchungen zur Plasmavererbung. II. Mitteilung. Über eine Plastidenmutation mit intracellularer Wechselwirkung der Plastiden, zugleich ein Beitrag zur Methodik der Plasmonanalyse und zur Entwicklungsgeschichte von *Epilobium*. **(Genetical, ontogenetic and cytological investigations on plasmatic inheritance. Report II. On a plastid mutation with an intracellular mutual influence of the plastids, together with a contribution towards the method of plasmon analysis and towards the ontogeny of *Epilobium*).**
Planta 1957 : **50** : 60–106.

A chlorophyll mutation in *Epilobium*, investigated along the lines indicated in earlier work [cf. XXVII, 1050 and 3660], appears to have taken place in and been transmitted by factors localized in the plastids. Plastid transmission in variegated plants may generally be distinguished from other types of cytoplasmic inheritance by the presence of mixed cells containing both green and colourless plastids; the absence of mixed cells, however, in the present case, does not rule out plastid transmission but may be attributed to an intracellular effect of one type of plastid upon the other.

1140 Ehrlich, H. L. & Pfau, C. J.
Study of a plaque variation of *Bacillus megaterium* phage.
Canad. J. Microbiol. 1957 : **3** : 1011–14.

Evidence has been obtained that phage ψ 16Bcl gives rise to progeny like itself when multiplying by lytic cycles and to variants with respect to plaque type during lysogeny.

1141 Fraser, A. S.
Simulation of genetic systems by automatic digital computers. I. Introduction.
Aust. J. biol. Sci. 1957 : **10** : 484–91.

An introductory exposition is given of ways in which the Monte Carlo method for simulating stochastic processes can be used in an automatic digital computor for representing genetic processes. The problems discussed are representation of the genotype in binary notation, determination of phenotypic value, interallelic interaction, representation of environmental effects by using Hastings's functions for producing approximations to random normal deviates, segregation and recombination, and selection.

1142 Fraser, A. S.
Simulation of genetic systems by automatic digital computers. II. Effects of linkage on rates of advance under selection.
Aust. J. biol. Sci. 1957 : **10** : 492–99.

The method of simulating genetic processes in a digital computor outlined in the preceding abstract is applied to a system involving six loci, complete dominance, 20–25 generations, linkage varying from nil to complete, two population sizes and two selection pressures. The trial runs exemplified the effect of small population size on variability between generations and of tight linkage (r = 0·005) on rate of genetic advance. The effects of looser linkage (r = 0·25–0·025) were negligible or slight.

1143 Li, C. C.
Repeated linear regression and variance components of a population with binomial frequencies.
Biometrics 1957 : **13** : 225–33.

Suppose several genotypes have frequencies in accord with the binomial distribution and a measurement y is available for each genotype. The author considers the regression of y on the binomial variable and divides the "genotypic variance" of *y* into components.

1144 BENNETT, J. H.
The enumeration of genotype-phenotype correspondences.
Heredity 1957 : **11** : 403–09.

"A general method is described for the enumeration and classification of the genotype-phenotype relationships possible with a single diploid locus and any number of allelomorphs."
[Author's summary].

1145 BENNETT, J. H.
Selectively balanced polymorphism at a sex-linked locus.
Nature, Lond. 1957 : **180** : 1363–64.

It is shown that it is neither necessary nor sufficient, in cases of selectively balanced polymorphism at a locus in the X chromosome, for the heterozygote to be at a selective advantage with respect to both homozygotes. Neither is it true that an excess of heterozygotes compared with homozygotes necessarily indicates heterosis at such a locus.

1146 PARSONS, P. A.
Selfing under conditions favouring heterozygosity.
Heredity 1957 : **11** : 411–21.

"The progress towards homozygosity is considered for situations where homozygotes are at a disadvantage or lethal. Selfing, although impossible in some organims, provides a basis for comparison and has the advantage of relatively simple algebra. Matrix methods are used in the calculations.

"Where homozygotes are of poor viability the approach to homozygosity is slower than for homozygotes and heterozygotes of the same viability. Loci linked to those in which heterozygosis is favoured approach homozygosity slower than if they were independent, the extreme case being the heterozygous inversion."
[Author's summary].

1147 STERN, K.
Die Pfadkoeffizienten-Methode und ihre Anwendung in der Züchtung. **(The path coefficient method and its application in breeding).**
Z. Pflanzenz. 1957 : **38** : 337–56.

The author explains how the path-coefficient method is used for estimating inbreeding effects, solving problems of population genetics and analysing quantitative variation. This method is particularly useful in dealing with forest and fruit trees.

1148 WHITEFIELD, J. F. & APPLEYARD, R. K.
Formation of the vegetative pool by induced defective and healthy lysogenic strains of *Escherichia coli.*
J. gen. Microbiol. 1957 : **17** : 453–66.

"Comparison of two defective λ prophages carried by strains of *Escherichia coli*, with respect to their physiological properties following induction, has revealed that one defective mutant (λi 2) can multiply normally as vegetative phage but cannot mature into normal infectious phage, whereas the other defective phage (λi 1) can undergo only limited multiplication since it is unstable in the vegetative state. Consideration of the properties of λi 1 has led to an hypothesis that radiation induction causes the prophage to produce a vegetative replica which becomes autonomous rather than conversion of the prophage into vegetative phage."
[Authors' summary].

1149 ENGLESBERG, E.
Physiological basis for rhamnose utilization by a mutant of *Pasteurella pestis*. II. A single mutational event leading to the production of two enzymes.
Arch. Biochem. Biophys. 1957 : **71** : 179–93.

When grown in the presence of rhamnose, the R^+ mutant of *P. pestis* produced two enzymes, viz. a rhamnose isomerase and a rhamnulocinase. Neither enzyme was detected in R^+ cells grown in the absence of rhamnose or in wild-type cells grown in the presence or absence of rhamnose or rhamnulose. This association of one mutational event with the production of two enzymes is interpreted in two alternative ways: (1) the mutation may affect a nucleotide common to two closely-linked loci respectively controlling the two enzymes or (2) the primary effect of the mutation may be upon the synthesis or activity of a "concentrating factor" which is required for the induction of the two enzymes with an external substrate.

1150 SUSKIND, S. R. & KUREK, L. I.
Enzyme-inhibitor complex in a tryptophan-requiring mutant of *Neurospora crassa.*
Science 1957 : **126** : 1068–69.

Highly active preparations of tryptophane synthetase were isolated from inactive crude extracts of the tryptophane-requiring mutant td_{22}, by purifying the extracts by means of protamine sulphate, ammonium sulphate and alumina gel. The amount of tryptophane synthetase in the mutant was about 30% of that in the wild type. Evidence is presented suggesting that this inactivation may involve the dissociation of an enzyme-inhibitor complex. The enzyme derived from the mutant appeared to be considerably more sensitive to the inhibitor than the wild-type enzyme. The inhibitor was also obtained from the wild type.

1151 Northrop, J. H. & Kunitz, M.
The proportion of mutants in bacterial cultures.
J. gen. Physiol. 1957 : **41** : 119–29.

Formulae are derived for the relationship between the proportion of mutants in various types of bacterial culture and mutation rate and the growth rates of the wild and mutant cells. An extension to cases where mutation occurs without cell division is also made. Back mutation is assumed to be negligible.

1152 Northrop, J. H.
The proportion of terramycin-resistant mutants in *B. megatherium* cultures.
J. gen. Physiol. 1957 : **41** : 131–41.

Good agreement for the relation between proportion of terramycin-resistant mutants, mutation rate and the growth rates of wild and mutant cells as determined (1) from the formulae derived in a previous paper [cf. 1151] and (2) by the null fraction method is reported.

1153 Steel, R. & Walker, T. K.
A highly specific growth-inhibitory factor produced by certain *Acetobacter* species.
Nature, Lond. 1957 : **180** : 811–12.

Evidence has been obtained that cellulose-producing cells of *A. acetigenum* 'NCIB8132' and NCIB5346', *A. xylinum* var. *africanum* 'NCIB7029' and *Bacterium xylinoides* 'NCIB4940' form a substance inhibiting the growth of celluloseless mutants. The discovery of this substance explains the failure of the authors to isolate this type of mutants from cellulose-producing cultures of *A. acetigenum* 'NCIB8132' by the indirect-selection method of Lederberg and Lederberg.

1154 Steel, R. & Walker, T. K.
Mutants of *Acetobacter xylinum* and *Bacterium xylinoides* which do not produce cellulose.
J. Inst. Brew. 1957 : **63** : 510–12.

Unlike the parent cultures, celluloseless mutants of the above bacteria grew at 40° C., were unable to oxidize ethanol and in most cases showed proteolytic activity.

1155 Fenn, W. O., Gerschman, R., Gilbert, D. L., Terwilliger, D. E. & Cothran, F. V.
Mutagenic effects of high oxygen tensions on *Escherichia coli.*
Proc. nat. Acad. Sci. USA 1957 : **43** : 1027–32.

The number of streptomycin-independent mutants arising spontaneously from a streptomycin-dependent strain was increased 1·5–2·4 times as the result of treatment for 16 hr. with 6–10 atm. of oxygen.

1156 Beiser, S. M. & Davis, B. D.
Mucoid mutants of *Escherichia coli.*
J. Bact. 1957 : **74** : 303–07.

A heritable change to mucoid growth was observed to appear at the same time as several biochemical mutations in the W strain of *E. coli*. Since the mucoid property and the growth requirements reverted independently it is suggested that they resulted from two distinct mutations.

1157 Durham, N. H. & Wyss, O.
Modified method of determining mutation rates in bacteria.
J. Bact. 1957 : **74** : 548–52.

"A method for measuring induced mutation rates is described which eliminates many of the time consuming processes employed in other methods, allows the detection of a large number of different mutations, permits the assaying of large populations which would facilitate the detection of rare mutations, and yet is effective enough to allow the complete phenotypic expression and recovery of induced mutants. "Ultraviolet light and manganous chloride were tested for their mutagenic activity on the streptomycin resistant and threonine independent loci of two different organisms, a threonine dependent strain (Texas) of *Escherichia coli* strain B and the Y–53 strain of *E. coli* strain K–12. The results indicate a definite difference in the mutagenic activity of these two mutagens on the loci tested. The ultraviolet light exhibited activity that appeared to affect both loci in a similar manner, while manganous chloride showed a distinct difference in its activity on the two loci."

1158 Quadling, C. & Stocker, B. A. D.
The occurrence of rare motile bacteria in some non-motile *Salmonella* strains.
J. gen. Microbiol. 1957 : **17** : 424–36.

It is thought that the rare motile bacteria occurring in 22 of 48 nonmotile *Salmonella* strains are not mutants since their progeny are nonmotile. The suggestion is made that motility is due to the presence of "non-multiplying motility-conferring particles" transmitted to the progeny at cell division. "It is inferred that small numbers of such particles arise during an intercellular 'event'; this event probably consists of a transient ability to synthesize new flagella." [Cf. XXVII, 1049, 1057 and 3661].

1159 Leupold, U.
Zur Feinstruktur einer Genregion von *Schizosaccharomyces pombe.* **(On the fine structure of a gene region of *Schizosaccharomyces pombe*).**
Verh. schweiz. naturf. Ges. 1956 : **136** : 123–25.

The author discusses work summarized previously [XXVII, 1182 and 1183]. The gene region responsible for adenine synthesis is reported to contain nine different loci in a length of 0·15 morgans.

1160 Wetherell, D. F. & Krauss, R. W.
X-ray induced mutations in *Chlamydomonas eugametos.*
Amer. J. Bot. 1957 : **44** : 609–19.

After a lag period of 1–20 days, X-ray-induced nutritional mutants of *Ch. eugametos* were capable of growth on a minimum medium at a rate equalling or slightly exceeding that on a complete medium. The nutritional requirements of the mutants were relatively nonspecific. The lag period could be repeatedly demonstrated in subcultures, each mutant exhibiting a characteristic lag. Comparison of curves for X-irradiation survival of this species and haploid and diploid strains of *Ch. reinhardii* suggested that, although functionally haploid, *Ch. eugametos* may be a species in which the genetic material has undergone a considerable amount of duplication. In addition, the proportion of surviving cells giving rise to colonies of subnormal size was found to be associated with number of chromosome sets, the diploid of *Ch. reinhardii* having the lowest and the haploid the highest proportion; *Ch. eugametos* occupied an intermediate position. The dose-response curve for this effect was exponential. Seventy per cent of the nutritional mutants were derived from colonies of subnormal size. It is postulated that the mutant phenotypes were in many cases the result of chromosomal deletions in segments which are normally duplicated and that such deletion temporarily weakened the synthetic capacity.

1161 Gots, J. S. & Gollub, E. G.
Sequential blockade in adenine biosynthesis by genetic loss of an apparent bifunctional deacylase.
Proc. nat. Acad. Sci. USA 1957 : **43** : 826–34.

Accumulation of the ribotide of 5-amino-4-imidazole-N-succinylocarboxamide (S–AICAR) by some adenine-requiring mutants of *Escherichia coli* and *Salmonella typhimurium* was found to be due to a mutational loss of a deacylating enzyme which splits S–AICAR, with the resulting formation of the ribotide of 5-amino-4-imidazolecarboxamide. Loss of this activity was accompanied by loss of the capacity to deacylate adenylosuccinic acid to give adenylic acid (AMP). Thus a single mutational event caused the loss of two sequential reactions in the biosynthesis of AMP.

1162 Gutz, H.
Zur Entstehung von atmungsdefekten Mutanten bei einem Stamm von *Saccharomyces carlsbergensis.* **(On the origin of mutants with respiratory defects in a race of *S. carlsbergensis*).**
Naturwissenschaften 1957 : **44** : p. 545.

By keeping race 51D of *S. carlsbergensis* in a solution of glucose-peptone-yeast extract for three days at 28° C., mutants were produced. After four or five repetitions of the treatment, the culture consisted entirely of stable mutants. The mutation rate was much lower in *S. cerevisiae* race 37F, under identical conditions, and was lower in 51D when the temperature was reduced to 7° C.

1163 Williams, N. D.
Effects of incorporated radiocarbon, C^{14}, on somatic flower-color variations and morphological changes in the snapdragon, *Antirrhinum majus.*
Diss. Abstr. 1957 : **17** : Publ. No. 17,369 : p. 219.

Plants of an F_1 hybrid with the genotype $Ww\ Iviv\ Yy\ Dil_p dil_p\ Dil_L dil_L$ for flower colour and plants of the variety Windmillers Lilac ($WW\ IvIv\ YY\ Dil_p Dil_p\ dil_L dil_L$) were grown from the seedling stage to maturity in atmospheres containing radioactive carbon dioxide. Thus the plants were continuously irradiated with β rays from C^{14} incorporated during photosynthesis. The estimated dosages were respectively 0·69, 3·5, 25·8 and 160 rep/day for plants raised in air-phase specific activities of 4, 25, 150 and 900 μc/g. carbon. Flowers of the F_1 hybrids were scored for somatic mutations, each white or pink area in the purple petals being scored as one mutation. The frequency of somatic mutations increased from 0·20 mutant areas/cm.^{2} in the controls to 0·42, 0·51, 1·89 and 9·35 at air-phase activities of 4, 25, 150 and 900 μc/g. respectively. The rate of increase in the frequency of mutations with increased dosage was greater for the white than for the pink areas. Pink mutations were on the average 7·5 times as frequent as white. Gene mutations, deletions, position effects associated with chromosomal rearrangements, inherited cytoplasmic changes and somatic crossing over are suggested as possible causes underlying the production of the mutant areas.

Comparisons with the results of other investigators indicate that C^{14} treatment was more effective in producing somatic flower-colour mutations than an equivalent amount of ionization from chronic γ radiation.

Treated and control plants of Windmillers Lilac were self pollinated and outcrossed to Ethel (*WW iviv yy* $dil_p dil_p$ $Dil_L Dil_L$). No flower-colour mutations were observed in F_1 outcrosses of the control and plants grown at air phases of 4, 24 and 150 μc/g. carbon. "The progeny of one self-pollinated Windmillers Lilac plant segregated for visible purple pigment normally found in the leaves and stems of this variety."

1164 Mundry, K.-W.
Die Abhängigkeit des Auftretens neuer Virusstämme von der Kulturtemperatur der Wirtspflanzen. (**The dependence of the appearance of new virus strains on the temperature at which the host plant is grown**).
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 407–26.

In leaves of Samsun tobacco inoculated with the *vulgare* mosaic virus the number of deviating symptoms increased with a rise in temperature, the deviations consisting mainly in the production of yellow spots. The concentration of the virus increased with temperature up to an optimum at 25° C. and then fell; the curve for actual amount of virus showed an optimum at the same temperature, whereas the curve relating to the growth of the host plant had its maximum at 31° C. The amount of yellowing rose uninterruptedly with temperature between 17° and 25° and cannot therefore be dependent on either the virus concentration or rate of plant growth. The rate of back mutation from *flavum* to green also rose uninterruptedly with temperature. The change in symptoms occurred even after exposures of only 24 hr. to temperatures of 35° if applied shortly after inoculation and it is concluded that it results from increased mutation of the virus rather than the operation of selection.

1165 Rosen, G. von
Mutations induced by the action of metal ions in *Pisum*.
Hereditas, Lund 1957 : **43** : 644–64.

Using *P. abyssinicum*, experiments were carried out to discover whether bivalent metal ions known to be radiomimetic are also mutagenically active [cf. XXIV, 1623 and XXVI, 70]. Steeping germinating seeds in a combination of nitrate salts of different metal elements did not induce any mutants. Some chlorophyll-deficient mutants were obtained as the result of repeated spraying with a mixed solution of the nitrates of 10 metals when the plants were 2–4 weeks old. Repeated injection of young buds with this mixture also caused mutation. In yet another experiment, plants growing in pots filled with soil or vermiculite were treated with a metal-ion solution at the age of 2–3 weeks, the concentration and doses being adjusted so that the plants were somewhat weakened and thus rendered more sensitive to the action of the metal ions. This experiment comprised the following: (1) the control, (2) treatment with a solution consisting of nitrates of Cu, Zn, Cr, Mn, Fe, Co, Ni, Al and Li, mixed with nitrates of Ag, Cd, Hg and Tl, and (3) treatment only with nitrates of radiomimetic metals which are essential elements, a combination of Mg, Ca, Cu, Zn, Mn, Fe, Co and Ni being used. The plants received no or very little fertilizer. Chlorophyll mutants were obtained as the result of treatments (2) and (3) and, in the case of (3), also waxless mutants. The types of chlorophyll mutant were similar to those occurring spontaneously and induced by ionizing radiations and certain chemicals in *P. sativum* and *P. abyssinicum*. The spectrum of the chlorophyll mutants induced by metal ions most closely resembled the spectra produced by neutron and X-ray treatments. The author postulates that disturbance in chelate formation is the fundamental cause of the mutagenic and radiomimetic activity of metal ions. It is suggested that these ions react with the nucleosides or with the simple N bases in the plasma, and when present in overdoses enter into the formation of abnormal chelates with high stability constants, chelates necessary at a subsequent stage in the balanced synthesis of the cell thus being bound. The possible role of the complex-forming metal ions is discussed. Attention is also drawn to the probable value of the metal ions as mutagenic agents in plant breeding, particularly in combination with X irradiation.

1166 Luzzati, D.
Sur les répercussions génétiques de la substitution de la thymine par le 5-iodouracyle dans l'acide désoxyribonucléique de *E. coli* 15 T^{-}. **(On the genetical effects of substituting 5-iodouracyl for thymine in the deoxyribonucleic acid of *E. coli* 15T^{-}).**
CR Acad. Sci. Paris 1957 : **245** : 1466–68.

Thymine-deficient *Escherichia coli* '15T^{-}' grown in the presence of both 5-iodouracyl and thymine showed an increase in number of streptomycin-resistant mutant patches as compared with controls supplied with thymine alone. The number of mutants appeared to be correlated with the proportion of thymine replaced by 5-iodouracyl in the bacterial DNA.

1167 Srb, A. M.
Exotic growth forms in *Neurospora*.
J. Hered. 1957 : **48** : 146–53.

A number of morphological and biochemical mutants have been derived from strain 74A of *N. crassa* by treatment with β-propiolactone. A form with compact habit, referred to as "melon", and found to differ from the wild type by a single gene, gave rise to mushroom-shaped forms possessing a second mutant gene, not allelic with that conditioning melon. This second gene in an otherwise wild-type genetic background determined an aconidial phenotype. Some of the expected recombinations involving melon were not found in the progeny of crosses where the fusion nuclei were expected to be heterozygous at both mutant loci.

1168 Ehrenberg, L. & Gustafsson, Å.
On the mutagenic action of ethylene oxide and diepoxybutane in barley.
Hereditas, Lund 1957 : **43** : 595–602.

Resting and presoaked seeds of Bonus were treated with solutions of ethylene oxide and diepoxybutane at room temperature. Diepoxybutane was about 300 times more effective than ethylene oxide in causing mortality at maturity and sterility expressed as a percentage of sterile flowers per spike. The former substance was about 50 times more mutagenically efficient than the latter, as indicated by data on chlorophyll mutants. Relative to the effects on survival and sterility, ethylene oxide was however more specifically mutagenic than diepoxybutane. Since the effects on germination rate, survival at maturity, sterility and mutation rate were proportional to the concentration, the two compounds reacted directly with the nuclear material. The compounds did not differ as regards the relative frequencies of the different types of chlorophyll mutations they induced.

1169 Haas, F. L. & Doudney, C. O.
A relation of nucleic acid synthesis to radiation-induced mutation frequency in bacteria.
Proc. nat. Acad. Sci. USA 1957 : **43** : 871–83.

In *Escherichia coli* grown in a minimum medium and exposed to ultraviolet rays, the frequency of mutation per unit dose of radiation and the maximum frequency of mutation to aberrant colony colour upon subsequent incubation on Difco eosin - methylene blue agar may both be increased considerably by short-period incubation prior to irradiation in a minimum medium supplemented with yeast extract, a combination of purines and pyrimidines, riboflavin or p-aminobenzoic acid. Using cultures synchronized in growth and division, the following conclusions were reached concerning the enhancement of the mutagenic response by purines and pyrimidines: (1) the greatest increases in frequency of mutation are attained during periods of maximum nucleic-acid synthesis, (2) the maximum increase in frequency occurs prior to and during the first nuclear division; (3) this increase is reduced by cell division, and when cell division is completed, a second increase in frequency takes place which is comparable and additive to the initial one; (4) the intensification of the mutagenic reaction bears no relation to the nucleic-acid content of the cell but may instead depend upon an increase in nucleic-acid precursors in the cell prior to irradiation; and (5) the increase in mutation frequency is dependent on the protein synthesis subsequent to irradiation.

1170 Ishikawa, T. & Tanaka, N.
The spontaneous reversion rate in the homocysteineless strains of *Ustilago maydis*.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 15–19.

Five homocysteineless strains were found to fall into three groups in respect of reversion rate: (1) 6·9 x 10^{-7}, (2) 1·3 x 10^{-5} and (3) 8·9 x 10^{-5} per sporidium per generation. It is suspected that the three groups represent pseudoalleles. Investigation of the relation between reversion rate and limiting concentration of methionine in the minimum medium by the Poisson distribution method [cf. XX, 792] produced no evidence of induced adaptation. [Cf. XXVII, 2486].

1171 MATON, K.-Š. [MATHON, C.-C.]
(The growth of the Mičurinist movement in the biological and agronomical sciences of France).
Agrobiologija (Agrobiology) 1957 : No. 4 : 114–22. [Russian].

Extracts from papers by Stroun, Leroy, Portères, L'Héritier and other French scientists are cited in an attempt to show that Mičurin-Lysenko genetics is gaining ground in France. In particular references are made to experiments with viruses, peas, potatoes and other plants which are said to vindicate inheritance of acquired characters.

1172 GLAVINIČ [GLAVINIĆ], R.
(Heterogeneity of plant tissues).
Agrobiologija (Agrobiology) 1957 : No. 4 : 149–50. [Russian].

A sexual F_1 cotton hybrid of *Gossypium barbadense* x *G. hirsutum*, which combined the characters of both its parents, was vegetatively reproduced for several generations in Belgrade until it gave only pure segregates of maternal and paternal type. Pure parental types were also obtained in the same way from a vegetative hybrid of tomato, which originally bore rounded pear-shaped and flat ribbed fruits. It is thought that the experiments prove that a hybrid plant has heterogeneous tissues.

1173 TOKUDA, M. & CVETOV, V. (translator)
(A history of connexions between Soviet science and Japanese agronomy and biology).
Agrobiologija (Agrobiology) 1957 : No. 4 : 109–13. [Russian].

Mention is made of research in biology along Soviet lines undertaken in Japan. Papers are referred to on Mičurin-Lysenko genetics, Oparin's views on the origin of life and Lepešinskaja's theory of the cell.

1174 LYSENKO, T. D.
(An address dealing with the questions of plant nutrition at a session of the Lenin Academy of Agricultural Sciences).
Agrobiologija (Agrobiology) 1957 : No. 3 : 3–15. [Russian].

This report read at a meeting in April 1957 refers to the appearance of nodular bacteria of the lupin in soil from which they were previously absent as an example of interspecific conversion from other bacteria.

1175 HANSON, W. D. & JOHNSON, H. W.
Methods for calculating and evaluating a general selection index obtained by pooling information from two or more experiments.
Genetics 1957 : **42** : 421–32.

"A criterion for the determination of an average selection index from two or more segregating populations has been presented. The criterion is that the phenotypic weights be so selected that the average genetic advance is a maximum. Since a direct solution of the b_j's was impracticable, the phenotypic variances and covariances and the genotypic variances and covariances were merely pooled to obtain an estimate of the average b_j's. Weights for pooling the respective matrixes were then estimated and a set of phenotypic weights were obtained from the pooled matrixes. One iteration should be sufficient since changes in b_j do not affect appreciably the relative values of W_k and V_{pk}. "Procedures for the calculation of genetic progress expected in genetic worth or in individual characters if selection is to be based on any set of phenotypic weights were outlined. Such weights are considered as constants. A point of interest was that the ratio of the expected genetic advance for a general index to the maximum genetic advance expected for the data utilizing a selection index is the expected correlation between the indexes of phenotypic values obtained with the two indexes."
[from Authors' summary].

EVOLUTION

1176 CICIN, N. V. & TROŠIN, D. M.
(Darwin and the problems of modern biology).
Priroda (Nature), Leningrad 1957 : No. 8 : 3–14. [Russian].

The writers accept Darwinism but reject the theory of evolution put forward by Lysenko, neovitalism, neodarwinism, psycholamarckism and mechanolamarckism. Driesch, Strahov, Danilevskij, Weismann, Lotsy, De Vries and Bateson are among those criticized for distorting Darwinism. On the other hand, such scientists, as L. Burbank, J. Huxley, J. B. S. Haldane, Timirjazev, Vavilov and Mičurin are said to have done research which fortifies and promotes evolutionary theory.

1177 ZAVADSKIJ, K. M.
(Overpopulation and its role in evolution).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 426–49. [Russian].

The author accepts overpopulation, of which he envisages several kinds, for evolving and also some fairly stabilized plant species. Overpopulation may cause natural selection in diverse directions and is regarded as one of the active forces in the evolutionary process.

1178 Zavadskij, K. M.
(The object of modern Darwinism and its problems).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 583–95. [Russian].

In examining the essentials of Darwinism some clarification is offered as to what it does and does not imply, its basic feature being still regarded as the principle of natural selection, which viewpoint is shared by evolutionists and geneticists alike. It is pointed out that the so-called positive or Mičurinist Darwinism proclaimed by certain authors has in reality nothing to do with either Darwin or Mičurin, and moreover is based more on the views of its authors than on concrete data. More intensive study of the operation of natural selection in natural populations is recommended, particularly with a view to obtaining evidence as to how far selection can alter the limits of existing variation.

1179 Grubov, V. I.
(Was C. Fraas a forerunner of creative Darwinism ?)
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 488–93. [Russian].

A recent article by Halifman entitled Letters of K. Marx on C. Fraas and some questions of modern biology, is criticized for distortion of Fraas's views in order to promote Lysenko's evolutionary theories.

1180 Tahtadžjan, A. L.
[Direct adaptation or natural selection ? (Statistical laws in biology)].
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 596–609. [Russian].

In this review the random nature of the material upon which natural selection operates is emphasized; studies of the genetics of populations and of mutation in natural populations are cited in illustration of the adaptive action of selection, on the one hand, and of the occurrence, on the other, of nonadaptive evolutionary change leading to interspecific and intraspecific differentiation, especially by genetic drift and geographical isolation of small populations. Recent theories of creative Darwinism, all based on a belief in the inheritance of acquired characters, are classed with perpetual motion and geocentric astronomy as superstitions; it is pointed out that no explanation has been suggested as to a mechanism whereby the acquired characters are transmitted to the progeny and that the principle is idealistic and vitalistic and contrary to the canons of dialectic materialism.

1181 Ščerbak, S. N.
(Changing winter into spring cereals and spring into winter forms in the light of C. Darwin's theory).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 656–58. [Russian].

In a reply to an article by V. V. Skripčinskij [XXV, 2899], the author states that even a pure-line variety is in point of fact a population containing individuals differing in biological properties and quotes cases where changes have been effected in such populations by selection; he submits that this heterogeneity is not necessarily a sign of hybridity or mechanical admixture but a biological characteristic of any plant, expressing its capacity to respond to varying environmental conditions. The existence of a line that is pure in all respects is denied and Lysenko is cited as having named selection as the operative, creative factor in the conversions. The denial of the conversions is said to be contrary to the Darwinian theory.

1182 Skripčinskij, V. V.
(Once more on the conversion of winter cereals into spring and spring into winter in the light of C. Darwin's theory).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 610–24. [Russian].

Referring to criticisms by A. T. Truhinova the author reiterates his objection that no result of practical value has come from the experiments on conversion, a point not dealt with by Truhinova. While accepting the results described by authors on conversion, a number of which he reexamines, the writer repeats the evidence showing that the experimental material was heterozygous and the conversions therefore an effect of selection. Mentioning that the conversion of winter varieties into spring, or *vice versa*, is devoid of practical interest he further points out that in many other characters much of the experimental material has deteriorated, while a great part of it remained unchanged. Other published results are referred to which are invalidated by the fact that the material was grown in the open where temperatures were such that natural vernalization could take place; the validity of pubescence as a criterion of a winter form is also called in question.
Replying to S. N. Ščerbak [cf. 1181], the writer again repeats that he does not deny the conversions but only their interpretation as effects

of directed inheritance rather than selection; he cites later works of Lysenko as denying the role of selection and points out how all the cases of conversion described have been of a few individuals and not the entire population.

As a case of directed inheritance achieved by genetical methods, amphidiploidy is cited and it is prophesied that by the use of strictly scientific methods and control it will be possible to effect true conversions, including that of winter forms into spring.

1183 PIRIE, N. W.
The origins of life. Moscow Symposium.
Nature, Lond. 1957 : **180** : 886–88.

A review is given of the papers presented at the symposium on the Origin of Life recently held in Moscow. Special attention is drawn to the following points. Kropotkin maintained that petroleum may have a nonbiological origin. Many participants argued that life presupposes the activities of proteins, nucleic acids and high-energy phosphates; this view is criticized and it is suggested that even carbon compounds may have been unimportant when life first arose. The present importance of carbon compounds and in particular of proteins is ascribed to biochemical selection. Bernal's principle of "structural conservation or inertia" is also criticized.

1184 BERNAL, J. D.
"The origins of Life".
Nature, Lond. 1957 : **180** : p. 1220.

Further information on the symposium mentioned in the preceding abstract is given. Various research workers reported the formation of such compounds as aminoacids from simple molecules. Asymmetric syntheses on quartz catalysts were described by Klabunowski. Akabori reported polymerization of aminoacetonitrite on clay. Many papers dealt with the biochemical evolution of existing systems, including photosynthesis. Fox suggested that life arose in nearly boiling rather than cold water.

1185 PETROV, D. F.
(The importance of nucleic acids in protein synthesis and the problem of the origin of life).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1957 : No. **3** : 83–85. [Russian].

A new hypothesis of the origin of life, based on recent biological and biochemical research in England, the USA and the USSR, is set forth. It differs from Oparin's theory in that the formation of coacervates is associated with a later stage in the early development of life, instead of with its origin.

CYTOLOGY

1186 DAY, P. R.
Abnormal tetrads in *Coprinus lagopus*.
Heredity 1957 : **11** : p. 426. (Abst.).

Abnormal fruit bodies have resulted from one cross between two wild-type monocaryon stocks but are not produced by the reciprocal cross. Evidence that the abnormality is determined by the cytoplasm and is a result of aging is discussed.

1187 WEBB, R. B.
A study of available technics and their application in microbial cytogenetics.
Diss. Abstr. 1957 : **17** : Publ. No. 19,503 : 216–17.

"This investigation was directed toward the development of microbial cytogenetic procedures and the application of these procedures to a suitable test organism as a basis for their use with other microorganisms. *Nocardia corallina* was chosen as the principal test organism since preliminary studies indicated the existence of a unicellular, uninuclear, coccoidal stage in the growth cycle. The studies also suggested that the coccoidal stage was diploid and that a sexual process occurred during the life cycle. The crystal violet nuclear stain and the thionin-SO_2 nuclear stain were selected for extensive application of the basis of preliminary studies. Results from phase microscopy on living organisms and electron microscopy were compared to results obtained by the various staining methods. Properly controlled X-ray and ultraviolet irradiation technics were validated as aids to ploidy and genetic investigations. Evidence from successive irradiation of the diploid coccoidal cells strongly supported the recessive lethal theory of radiation damage. The correlation of cytological and radiobiological findings demonstrated that in *N. corallina*, a diploid coccoidal stage germinates to form a coenocytic diploid hyphal stage. The hyphae fragment to form haploid dinucleated bacillary cells. The two nuclei of the bacillary cells fuse and diploid coccoidal cells are formed by division of the bacillary cells. The haploid 'chromosome' number for this organism is suggested as three. Study of morphological and color mutants confirmed the diploid nature of the coccoidal cells. Recombination between appropriate mutant strains substantiated the cytological evidence for a sexual process in the organism. It has been demonstrated that a microbial cytogenetic approach involving the correlation and integration of the best of cytological procedures with radiobiological and genetic studies can be used to solve basic problems of microbiology."

1188 ALLFREY, V. G. & MIRSKY, A. E.
Some aspects of ribonucleic acid synthesis in isolated cell nuclei.
Proc. nat. Acad. Sci. USA 1957 : **43** : 821–26.

"The ribonucleic acids of isolated thymus nuclei can be separated into two distinct fractions, one of which probably represents ribonucleic acid of the nucleolus. Studies of the incorporation of orotic acid–6–C^{14} and adenosine–8–C^{14} into these RNA fractions in vitro show great differences in their metabolic activity and different susceptibilities to an inhibitor of RNA synthesis, the 'nucleolar' RNA being by far the more active." [Authors' summary].

1189 BAKERSPIGEL, A.
The structure and mode of division of the nuclei in the yeast cells and mycelium of *Blastomyces dermatitidis.*
Canad. J. Microbiol. 1957 : **3** : 923–36.

A study was made of nuclei in the yeast and mycelial phases of *B. dermatitidis* in living cells and fixed preparations. The interdivisional nucleus consisted of a spherical Feulgen-negative central body enveloped by granular Feulgen-positive chromatin. A nuclear membrane was not observed in any material. During division, the chromatin became condensed and then elongated, finally separating into two sister nuclei. The role played by the central body in division is unknown; it was however noted that the component did not divide but became progressively smaller and apparently disintegrated in the cytoplasm. Mitotic figures were not detected. Configurations of 6–8 chromosome-like elements, without central bodies but including one or more darker-staining granules, were observed in some hyphae.

1190 WYGODZINSKY, P.
Nota sobre el método de Beeks para preparaciones permanentes de cromosomas. (**Note on the method of Beeks for permanent preparations of chromosomes**).
Rev. argent. Agron. 1957 : **24** : 118–20.

Two simplifications of the method described by Beeks [XXV, 1590] are suggested.

1191 CHENG, K. C.
On the process of intercellular migration of chromatin substance and new formation of nucleus in the pollen mother cells of *Lilium sutchuenense* Franch.
Sci. sin. 1957 : **5** : 497–508.

Instances of nuclear migration between pollen mother cells just before meiosis are reported. It is suggested that, in accordance with Lysenko's theory of vitality, migration may intensify the inherent contradictions in the cell and engender enhanced vitality for gametogenesis.

1192 TANDLER, C. J.
A chemically specific technique for the intracellular localization of inorganic phosphate.
J. Histochem. Cytochem. 1957 : **5** : 489–99.

By improving the cytochemical specificity of the lead acetate reaction [cf. XXVII, 82], inorganic phosphate has been found to be a normal component of the nucleolus in *Vaucheria*, *Oedogonium*, maize, onion, *Drosophila* and some other animals. The improvements consist of hardening with formaldehyde after fixation with lead acetate and use of ammonium acetate. The hardening treatment makes possible the cutting of frozen sections.

1193 JACKSON, R. C.
New low chromosome number for plants.
Science 1957 : **126** : 1115–16.

Haplopappus gracilis has been found to have $n = 2$, the centromere being near-median in one chromosome and subterminal in the other.

1194 SHARMA, A. K. & SHARMA, A.
Investigations leading to a new theory of differentiation in plant cells.
Genet. iber. 1957 : **9** : 143–57.

Chromosome counts made on 12 species of flowering plants revealed different chromosome numbers and caryotypes in different organs, meiotic cells and root-tip cells having predominantly the normal $2n$ number while stem apices contain a range of several numbers, one of which is the predominant number in leaf cells. In some species the leaf cells carry the normal $2n$ complement but are distinctive in caryotype. It is suggested that at the time of differentiation the different organs receive, and subsequently maintain, the appropriate chromosome complement and caryotype from the heterogeneous apical tissue.

1195 BRENNER, S.
On the impossibility of all overlapping triplet codes in information transfer from nucleic acid to proteins.
Proc. nat. Acad. Sci. USA 1957 : **43** : 687–94.

The number of aminoacid sequences in analysed proteins is shown to be too great to permit of a one-to-one correspondence with the nucleotide sequence of nucleic acids, assuming that specification resides in the sequence of nucleotides in overlapping triplets [cf. XXVI, 864].

1196 SANZ DE CORTÁZAR, C.
Observaciones cromosomales en plantas chilenas. II Parte. (**Chromosome observations in Chilean plants. II**).
Agricultura téc., Santiago 1955 : **15** : 5–11.

The chromosome numbers reported include $n = 12$ for *Solanum brevidens* and *S. tomatillo.*

1197 BRAENDLE, D. H. & SZYBALSKI, W.
Genetic interaction among streptomycetes.
Proc. nat. Acad. Sci. USA 1957 : **43** : 947–55.

Heterocaryosis was demonstrated among nutritionally-deficient mutants of the same strain of *Streptomyces griseus*, *S. griseoflavus*, *S. fradiae*, *S. venezuelae*, *S. albus*, *S. sphaeroides* and *S. coelicolor*, but not between mutants of diverse origin. Heterocaryons between aminoacid-requiring mutants of *S. coelicolor* and occasionally of other species were nutritionally unbalanced, being unable to grow on minimum media unless at least a part of the parental requirements was supplied. *S. coelicolor* and *S. fradiae* exhibited syncaryosis; the quantitative results were however strongly biased by apparent selective factors during the period intervening between caryogamy and scoring of recombinant colonies.

1198 NAKAI, S.
Electron microscopical study of the fine structure of *Tradescantia* chromosomes.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 52–58.

The chromosomes appeared to be invested in a chloroform-soluble matrix with a smooth surface. On dissolving the matrix, spiral chromonemata of minimum width 30–40 mμ were demonstrable.

1199 TORREY, J. G.
Cell division in isolated single plant cells in vitro.
Proc. nat. Acad. Sci. USA 1957 : **43** : 887–91.

A method of culturing single isolated cells derived from a friable pea-root callus tissue is described. Of the cells remaining viable one week after isolation, about 7% had divided. Division in some cases was not followed by cell enlargement but in others enlargement and further divisions took place.

1200 ZERPA, D. M. DE
Echeandia macrophylla Rose, como material didáctico en citología. (***E. macrophylla* Rose as material for instruction in cytology**).
Agron. trop., Venezuela 1956 : **5** : 247–51.

Pollen mother cells of the above material ($2n = 24$) are described as particularly favourable for the demonstration of meiosis. Illustrations are included.

1201 WALKER, G. W. R.
The effects of colchicine on microsporogenesis in cultured anthers of *Tradescantia paludosa.*
Amer. J. Bot. 1957 : **44** : 690–96.

Excised anthers were cultured on Taylor's medium containing 0·01, 0·1 and 0·0% colchicine for 24 and 48 hr. Glutamic acid, included in some media at a concentration of 100 p.p.m., did not cause lengthening of the effective culture period on Taylor's medium. Treatment with 0·1% colchicine, initiated at stages from zygotene to diplotene, and treatment at a concentration of 0·01% at zygotene only, prevented PMC nuclei from progressing further than prophase. Treatment at metaphase I with 0·1% caused the formation of restitution monads whereas treatment with 0·01% from pachytene to diplotene induced dyads or mixtures of dyads and tetrads. Treatment as late as metaphase II with 0·1% resulted in mixtures of dyads and tetrads but treatment with 0·01% from metaphase I caused the production of tetrads only. In the inhibited PMCs and restitution monads, thickened capsules and localized masses of refractive material associated with the capsules were observed. Similar masses were also seen in the region between the nuclei of dyads lacking first division walls. Other anomalies, consisting of encapsulation of chromosomes, telophase-II bridges and unequal division of the nucleus, appeared to be the consequence of the anther-culture method. The results of additional culture experiments indicated that c-meiosis in *T. paludosa* follows the same pattern as that described for *Allium cernuum* by Prakken and Levan [cf. XVI, 1178]. Estimates are given for the time sequence of the different stages of c-meiosis as induced by a concentration of 0·1% colchicine.

1202 Nordenskiöld, H.
Changes in somatic chromosome patterns in root tips of X-ray-treated *Luzula*.
Kungl. LantbrHögskolans Ann. 1957 : **23** : 273–89.

Root-tip cells of *L. capitata* and *L. pallescens* plants grown from seed irradiated with 20,000 r. or less showed no visible chromosomal changes. Treatment with 30,000–60,000 r. resulted in a number of changes in chromosome size resulting from fragmentation or interchanges, normal cells having 12 equal chromosomes. Above 80,000 r. numerous aberrations of this type occurred. After the moderate dosages *L. capitata* plants showed fewer aberrations at the age of five months than at three months, indicating that intrasomatic selection had occurred, and it is suggested that the lack of aberrations at low dosages may be accounted for by intrasomatic selection during embryo growth. This type of selection did not appear to take place in the mature plant. The progeny of treated plants were usually normal in chromosome type, presumably as a result of gamete selection.

1203 Oyama, T.
(Mitotic peculiarities following irradiation with high doses of X rays. III. Distribution of aberrant mitoses in root-tip cells of the onion).
Senshokutai (Chromosome)/Kromosomo 1956 : Nos. 30–31 : 1081–93. [Japanese].

In continuation of work already summarized [XXVI, 1992], the author describes the distribution and changes in distribution with time of various X-ray induced aberrations in the root apex. The first noticeable effect is abnormality of the chromosome matrix which occurs throughout the irradiated region. This is followed by abnormal aggregation of nuclear material and disappearance of the nucleolus and finally by mitotic aberrations. These latter effects appear first a little behind the apex and pass forward towards the apex with time.

1204 Steffensen, D.
Effects of various cation imbalances on the frequency of X-ray-induced chromosomal aberrations in Tradescantia.
Genetics 1957 : **42** : 239–52.

Further observations on the effect of calcium deficiency and other cation imbalances on the frequency of X-ray induced chromosome aberrations are reported and discussed [cf. XXVI, 74 and 894].

1205 Kato, Y.
Chromosome breaks and bridges induced by extracts from spinach and beet fruits.
Phyton 1957 : **8** : 131–36.

Fragmentation and anaphase bridge formation have been observed in onion root tips treated with extracts from spinach and beet fruits. Extracts from fresh fruits were less effective than those from aged fruits.

1206 Blackburn, K. B. & Morton, J. K.
The incidence of polyploidy in the Caryophyllaceae of Britain and Portugal.
New Phytol. 1957 : **56** : 344–51.

Chromosome counts have been made of 91 British and 85 Portuguese species and it is concluded that there is a correlation between polyploidy, latitude and glaciation. The influence of glaciation in the creation and survival of polyploid forms is discussed.

1207 Whittington, W. J.
The role of boron in plant growth. I. The effect on general growth, seed production and cytological behaviour.
J. exp. Bot. 1957 : **8** : 353–67.

It has been shown that in boron-deficient plants of *Trifolium pratense* and *Vicia faba* the rate of cell division is much less than in normal plants and in some cells abnormal uncoiling of chromosomes and enlarged spindles were observed.

1208 Davidson, D.
The irradiation of dividing cells. I. The effects of X-rays on prophase chromosomes.
Chromosoma 1957 : **9** : 39–60.

Mitotic prophases of *V. faba* (2*x*) and *Hyacinthus orientalis* (3*x*) were irradiated. Interstitial union of chromatids, mostly at homologous points, and terminal union of chromatids occurred during anaphase. The distribution of these point unions on the different chromosomes is described. Solutions of 8-ethoxycaffeine induced chromosome breaks during the resting stage and point unions during prophase in *Vicia*. Point unions are thought to involve either breakage of whole chromatids or reciprocal exchange of subchromatid fractions.

1209 SATO, S.
(Effects of antibiotics on dividing cells).
Senshokutai (Chromosome)/Kromosomo 1956 : Nos. 30–31 : 1051–69. [Japanese].

The effects of streptomycin, actidione, neomycin, sarkomycin, penicillin G and endomycin on mitotic cells of *Tradescantia paludosa* were investigated. The following aberrations were induced: streptomycin, chromosome contractions, stickiness and swelling, fragmentation, micronuclei and nuclear fusion; actidione, chromosome contraction; neomycin, chromosome stickiness, fragmentation and micronuclei; sarkomycin, chromosome stickiness and clotting; penicillin G, little effect; and endomycin, chromosome stickiness.

1210 DAVIDSON, D.
Relation of colchicine to chromosome breakage.
Nature, Lond. 1957 : **180** : 1059–60.

After treating roots of *Vicia faba* with 0·05% colchicine for 3 hr., the author found no evidence that colchicine induced chromosome breaks in diploid or tetraploid nuclei. In addition, treatment of beans in 0·05% colchicine for 3 hr. prior to exposure to an X-ray dose of 120 r. delivered in 1 min. did not affect the frequency of radiation-induced breaks scored in diploid nuclei. Reasons are given for believing that colchicine pretreatment is not responsible for the high sensitivity to X-ray-induced breakage found by the author and other investigators in somatic nuclei at metaphase, but that this sensitivity is characteristic of metaphase itself.

1211 BERGER, C. A.
Some cytological effects of gibberellin.
Bull. Torrey bot. Cl. 1957 : **84** : 356–60.

Gibberellin did not induce c-mitosis or polyploidy in roots of *Allium cepa*, nor did it stimulate resting differentiated cells to enter into mitosis. The chief effect consisted of swelling of the matrix and breakage of the coiled chromonema at many points, so that the metaphase chromosomes had a segmented and later a banded appearance.

1212 ESSAD, S.
La polyploïdie et ses aspects évolutifs en relation avec l'amélioration des plantes. **(Polyploidy and its evolutionary aspects in relation to plant improvement).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 199–226.

Allopolyploidy and autoploidy are defined and the role they have played in evolution is discussed with reference to the views of Clausen, Keck and Hiesey. Natural conditions favouring the formation and preservation of polyploids are mentioned. The significance of polyploidy for plant breeding is considered; illustrations are given from work which has been done with a number of economic crops.

1213 DOUCET, R.
Ce que l'agriculture doit à la ploïdie. **(What agriculture owes to ploidy).**
Rev. Oka 1957 : **31** : 146–51.

A brief review is given of the advances in plant breeding and genetics made possible by altering chromosome numbers.

1214 OGG, J. E. & ZELLE, M. R.
Isolation and characterization of a large cell possibly polyploid strain of *Escherichia coli.*
J. Bact. 1957 : **74** : 477–84.

ZELLE, M. R. & OGG, J. E.
Radiation resistance and genetic segregation in a large cell possibly polyploid strain of *Escherichia coli.*
Ibid. 1957 : **74** : 485–93.

In the first of these contributions a stable, large-celled strain of *E. coli*, with cells about three times the size of those of the parent strain, is described and designated P6. It was isolated from strain 82/r, a mutant of strain B/r, following repeated exposure to camphor vapour. Evidence is discussed suggesting that P6 is diploid. The results of X-ray and γ-ray treatment of P6 are discussed in the second paper. P6 was more resistant than 82/r to X, γ, and ultraviolet rays and these results also are interpreted as indicating that P6 is a diploid derivative of 82/r. "Segregation of radiation resistance and cell size in reversed crosses is influenced by F polarity in a manner similar to unselected markers in general."

1215 GOTOH [GOTO], T.
Effects of temperature on the action of colchicine.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 37–47.

The effect of 48-hr. colchicine treatment on root tips of *Allium japonicum* was studied over a temperature range of 5–30° C. At high temperatures, c-tumour formation is conspicuous, the threshold concentration for c-mitosis drops and polyploid mitoses appear but cell division is quickly inhibited. At low temperatures, reductional groupings are frequent. Polyploid induction is best at intermediate temperatures (15° C.).

1216 Katayama, Y.
Studies on the haploidy in relation to plant breeding. I. Introductory contribution.
Miyazaki Daigaku Jiho (Shizenkagaku)/ Bull. Miyazaki Univ. (Nat. Sci.) 1950 : No. 1 : 28–30.

The usefulness of haploids for obtaining completely homozygous diploids is briefly discussed.

1217 Nygren, A.
Studies in polyploid *Melandrium album* produced by nitrous oxide, N_2O.
Kungl. LantbrHögskolans Ann. 1957 : **23** : 393–404.

Studies of the polyploids referred to earlier [XXV, 2707] show that one Y chromosome may induce maleness in the presence of three X chromosomes, but that the effect of the Y chromosome may be upset by additional sex-determining genes in the autosomes.

1218 Sinskaja, E. N., Vorob'eva, F. M. & Pogorleckij, B. K.
(Knowledge of the interrelationship between growth and development in higher plants).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 75–124. [Russian].

Varieties of several plants were grown for varying numbers of days in natural daylight before subjecting them to short days or, in the case of short-day plants, for varying periods in a short day before transferring them to a natural day. By following the effect on the time of flowering, it was found that in many a sharp inclination in the flowering curve towards that of the control occurred after a particular number of days of normal daylight. This was thought to correspond to the completion of the light stage in phasic development and was in some plants accompanied by a sudden morphological change such as the formation of floral bracts or a modified leaf structure. The completion of the light phase was often, but not always, marked also by the differentiation of the floral organs. This stage coincided in many plants with a period of maximum growth of the main stem; in others no such association could be detected. Differences in this respect were noted in some cases between ecotypes within a species and in others between related genera. Several examples are given of populations that appeared uniform when grown under natural conditions but broke up, when subjected to certain conditions of vernalization or photoperiod, into a number of different morphological types; with increasing doses of such treatment the heterogeneity of the population rose to a maximum and then fell, ultimately reaching a state of apparent uniformity again. When such a population is subjected for long periods to unusual ecological conditions, as in some new area of cultivation, one of the divergent types may be selected and give rise to a new ecotype. This is thought to be the way in which the annual cottons have arisen from the perennial species; dwarf early-maturing forms of *Perilla ocymoides* have probably originated in the same way from the original late varieties, since such forms have arisen in the present experiments under treatment with short days followed by sudden transference to long days. By treatment with 9-hour days for 25 days it was possible to separate two distinct types, long-day and short-day forms respectively, from a sunflower variety, VNIIMK 1646 [Research Institute for Oil Crops 1646], which when grown under natural conditions or under continuous light appeared quite uniform; the progenies of the two types inherited the different photoperiodic reactions and differed also in morphological features: the short-day progeny ripened earlier, was shorter in stature, had a smaller number of leaves and larger seeds. Treatment of other varieties in the same way showed some of them to be more uniform and others less so. From crosses between the different photoperiodic types selected from variety 1646 it has been possible to create a sunflower combining a long-day reaction with early maturity, which is thought to be of value for growing in northern regions.

1219 Schwemmle, J.
Der Einfluss des Plasmas auf die Affinität zwischen Samenanlagen und Pollenschläuchen. **(The influence of the cytoplasm on the affinity between ovules and pollen tubes).**
Biol. Zbl. 1957 : 76 : 443–53, 529–49.

In crosses using *Oenothera* species with various combinations of nucleus and cytoplasm, the degree of chemotropism shown by a pollen tube was determined chiefly by the nuclear constituents but also by the cytoplasmic components of both male and female parents.

1220 Fuerst, R. & Wagner, R. P.
An analysis of the free intracellular amino acids of certain strains of *Neurospora*.
Arch. Biochem. Biophys. 1957 : **70** : 311–26.

Data are provided and discussed on the free intracellular aminoacids present in the cells of 28 strains of *N. crassa*, a total of 35 aminoacids being identified. Significant differences were found in the aminoacids present in some mutant strains and in wild-type hyphae and the results of crosses and back crosses between mutant and wild-type strains indicate that a characteristic aminoacid pattern is associated with mutant genotypes and is related to the single gene mutation responsible for the characteristic phenotype of the strain concerned.

TAXONOMY

1221 van Steenis, C. G. G. J.
Specific and infraspecific delimitation.
Flora Malesiana : Ser. I : 1957 : **5** : clxvii–ccxxxiv.

On the basis of the concepts of classical taxonomy and under the following headings, the author gives a comprehensive analysis of the basic problems of specific and infraspecific delimitation among plants: introduction; general considerations; patterns of phenotypic and genotypic variability; specific polymorphism and adaptation characters; anthropogenous influence and specific delimitation; specific delimitation in cultivated plants; hybridization, miscibility and specific delimitation; chromosome races; apomicts and specific delimitation; practical taxonomy; conclusion and theses; and rules and recommendations for taxonomic work.

1222 Li, H.-L.
A symbol for introgressants.
Taxon, Utrecht 1957 : **6** : 216–18.

It is suggested that introgressive hybrids should be designated by the names of the parental species joined by the > sign, with the species showing the larger proportion of morphological characters placed first.

1223 Sneath, P. H. A.
The application of computers to taxonomy.
J. gen. Microbiol. 1957 : **17** : 201–26.

"A method is described for handling large quantities of taxonomic data by an electronic computer so as to yield the outline of a classification based on equally weighted features. This enables *Similarity* to be expressed numerically, and would allow taxonomic rank to be measured in terms of it. An example in bacteria is given, and the results compared with the conventional classification. The method is to count the number of similar and of dissimilar features between strains and to sort the strains into groups whose members have a high percentage of similarities." [Author's summary].

CROP PLANTS

1224 Dick, W. E.
L'energia atomica in agricoltura. (**Atomic energy in agriculture**).
Ital. Agric. 1957 : Spec. No. Pp. 984.

This special number of the journal *L'Italia agricola* comprises an Italian translation of a book referred to earlier [1069].

1225 Parkin, A.
The spoils of power.
Fmrs' Wkly. 1957 : **47** : No. 3 : 68–71.

Work at Wantage Radiation Centre, Berks., includes the use of radiation in breeding for disease resistance and in breaking down interspecific incompatibility in barley, clover and *Brassica*.

1226 Aufhammer, G.
Grundlagen und Erfolge ausländischer Pflanzenzüchtung. (**Bases and achievements of plant breeding in other countries**).
Z. Pflanzenz. 1957 : **38** : 313–26.

In a lecture on the achievements of plant breeders in countries other than Germany the speaker referred, among other things, to the production of varieties with a greater capacity to withstand and respond to high manurial dressings, the use of electronic computors for the choice of parental varieties from the world collections, new soya-bean varieties yielding 20% more than wheat in northerly areas of North America, a wheat hybrid resistant to race 15B of stem rust and others with field resistance to *Septoria* (*Leptosphaeria*) *nodorum*. Attention was drawn to the advantages of back crossing, testing in early generations, polycrosses, the use of heterosis and the determination of such properties as malting quality or winter hardiness on small samples. Rye, red clover and swedes are mentioned among the plants in which certain advantages can be gained from the induction of polyploids and reference is made to the use of induced mutation in Sweden, the USA and elsewhere [cf. 193–5].

1227 de Haan, H.
Kruising binnen een ras van zelfbevruchters. (**Intravarietal crossing in self pollinators**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : p. 96.

Recommendations made by G. Becker in East

Germany for crossing self-pollinating plants during the early stages of breeding with the aim of obtaining physiologically diverse, and therefore widely adapted, populations which are nevertheless morphologically uniform are described briefly. It is suggested that further data on the advantages of this breeding method over the normal method of line selection would be of value.

Die Frühdiagnose in der Züchtung und Züchtungsforschung. Beiträge zur Methodik der Züchtung langlebiger Pflanzen. (**Early diagnosis in breeding and breeding research. Contributions to the method of breeding long-lived plants**).
Züchter 1947 : 4. Sonderheft : Pp. 96.

1228 *Sengbusch, R. von Frühdiagnose.* (*Early diagnosis*). (*pp. 1–4*).

By means of examples it is explained that early diagnosis involves the determination in young plants of characters which at that time may be unexpressed or difficult to recognize. Early diagnosis facilitates the study of large numbers of plants and the planning ahead of hybridization programmes.

1229 *Kappert, H. Die genetischen Grundlagen der Frühdiagnose.* (*The genetical bases of early diagnosis*). (*pp. 4–9*).

Examples are described to illustrate how gene linkage and pleiotropy may make possible the early diagnosis of characters which are not expressed phenotypically in young plants.

1230 *Schwanitz, F. Entwicklungsphysiologische Grundlagen der Frühdiagnose.* (*Foundations in developmental physiology for early diagnosis*). (*pp. 9–14*).

Coupling of physiological processes with morphological characters is discussed with special reference to the inheritance of gigas characters. Application of this coupling for the early diagnosis of characters is also considered.

1231 *Loewel, E. L., Schander, H. & Hildebrandt, W. Untersuchungen zur Entwicklung von Frühselektionsmethoden für die Apfelzüchtung. I. Über Beziehungen zwischen Blatt- und Fruchtmerkmalen beim Apfel.* (*Research into the development of early selection methods for apple breeding. I. On relations between leaf and fruit characters in the apple*). (*pp. 15–332*).

Fifty apple varieties from various countries were studied; the diploids differed from the triploids in respect of some relationships between leaf and fruit characters. A scheme for early selection dependent on correlated fruit and leaf characters is discussed.

1232 *Breider, H. Frühtestmethoden in der Rebenzüchtung.* (*Early test methods in grape breeding*). (*pp. 33–39*).

Methods of testing scions and rootstocks for quality, resistance to cold, drought and disease and anatomical characters affecting grafting are reviewed.

1233 *Schmidt, W. Die Sicherung von Frühdiagnosen bei langlebigen Gewächsen.* (*The securing of early diagnoses in long-lived plants*). (*pp. 39–69*).

Laboratory and field methods used in the early diagnosis of desirable characters in forest trees are discussed in some detail.

1234 *Gerhold, H. D. An investigation of criteria for the selection of* Pinus sylvestris *Christmas tree seedlings.* (*pp. 70–71*).

An outline is given of a project undertaken by the Agricultural Experiment Stations of New Jersey, New York and Pennsylvania to produce varieties of *P. sylvestris* suitable for Christmas trees. The development of selected individuals is to be evaluated periodically and the results will indicate the precision with which future characteristics may be predicted at a given age. Specifications of an ideal Christmas tree are included.

1235 *Jamblinne, A. Th. de Pourcentage de survie différentiel chez les hybrides du genre* Pinus. (*Percentage of differential survival in hybrids of the genus* Pinus). (*pp. 71–73*).

The percentage survival values of *P. sylvestris* x *P. nigra* and *P. sylvestris* x *P. pinaster* seedlings appeared on the whole to be greater than those of seedlings of the parental types. A correlation was found between the percentage survival of each hybrid and that of the female parent.

1236 *Karschon, R. Méthodes et applications de quelques diagnostics rapides dans la recherche forestière.* (*Methods and applications of some rapid diagnoses in forestry research*). (*pp. 73–75*).

Methods involving seed germination at 41° C. and studying the phototropic and photoperiodic reactions of young plants are described; these have been used to determine physiological races of *Pinus sylvestris*. Methods of testing seeds and seedlings for drought resistance are also described.

1237 *Moritz, O. Serologische Differenzierung von Arten als Voraussetzung der Frühdiagnose des Hybridcharakters.* (*Serological differentiation of species as a basis for the early diagnosis of hybrid characters*). (*pp. 75–76*).

A review is presented of some of the work done in this field. Serological experiments with interspecific *Larix* hybrids are described.

1238 *Larsen, C. M. L'enracinement individuel des boutures de peuplier.* (*The individual rooting of poplar cuttings*). (*pp. 77–84*).

Differences in rooting capacity were observed in Belgium between *Populus deltoides, P. nigra* and *P. trichocarpa*; interclonal differences occurred in *P. deltoides, P. nigra, P. alba* and some interspecific hybrids. Clonal variation in rooting capacity may be masked by the influence of the moisture content of the soil.

1239 *Nienstaedt, H. New tests for disease resistance in trees are needed.* (*pp. 84–87*).

The disadvantages of using natural infections or artificial inoculations in testing for disease resistance are mentioned. It is thought that by studying the chemical factors causing resistance more direct methods of testing the resistance of host tissue could be developed. Suggestions are made of possible approaches to such studies; chromatography is recommended.

1240 *Schopmeyer, C. S. Diagnostic techniques for the selection of slash pines having high yields of oleoresin.* (*p. 88*).

The procedure used at Lake City Research Centre, Florida, for selecting trees of *Pinus elliotti* with a high yielding capacity is described. Yielding capacity depends in part on the exudation pressure - viscosity ratio which is an inherited character.

1241 *Vincent, G. Einige Unterscheidungsmerkmale der Fichten- und Kieferntypen in ihrer frühen Jugend.* (*Some distinctive characters of spruce and pine types in their early youth*). (*pp. 88–93*).

This review deals with morphological and physiological differences found between provenance types in spruce and pine species. Seed and seedling differences are specially mentioned and their correlation with adult characters is discussed.

1242 *Wettstein, W. von Bericht über eine Nachkommenschaftsprüfung von Einzelbäumen von* Pinus nigra *mit verschiedenen Harzerträgen.* (*Report on a test of progeny from single trees of* P. nigra *with different yields of resin*). (*pp. 93–95*).

The progeny tested came from seed parents which had yielded for 10 years; the pollen parents were unknown. A positive correlation was found between the yielding capacity of six-year-old trees and that of the female parents; it is therefore considered unnecessary to wait until the plants are older before selecting for yielding capacity.

1243 *Zobel, B. J. Progeny testing for drought resistance and wood properties.* (*pp. 95–96*).

Procedures used in Texas for testing *Pinus taeda* for drought resistance and high specific gravity of wood are described. Row tests are more suitable than plot tests when these determinations are made on young trees.

1244 Jahrbuch 1955/1956. Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin. (**Yearbook 1955-56. German Academy of Agricultural Sciences, Berlin**).
1957 : Pp. 555.

The report gives an account of the activities of the academy during the period and of the various research projects under its egis. There follow the reports of the individual stations maintained by the academy of which the following are those containing matters relating to plant breeding.

Institut für Acker- und Pflanzenbau Müncheberg.

Forage plants. The achievements mentioned include the release of a hybrid of *Lupinus luteus* characterized by rapid growth and tall stature which ripens at the same time as oats and can be grown in mixtures with it.

Lucernes with improved seed yields have been selected.

White-clover hybrids produced by the polycross method have exceeded the approved varieties in yield.

Wild populations of a number of grass species are under observation and an electronic machine for counting and weighing seed samples has been constructed.

Fruit trees. New apple seedlings with good colour and quality have been selected. Among the 26 biotypes of *Venturia inaequalis* studied certain aggressive biotypes have been found. In back crosses of hybrids of *Malus zumi* x cultivated apples no improvement in size and quality of fruit has been observed.

Institut für Pflanzenzüchtung Bernburg.

The material released for official testing includes the first maize hybrid to be produced by crossing inbred lines, a spring barley resistant to mildew races A, C, and D, a form of *Phacelia tanacetifolia* suitable for farming conditions, an early-maturing oil pumpkin and a variety with improved seed yield and oil content, flax forms with better yield and quality of fibre, selected by the use of new methods of analysing the fibre from a single plant, a monecious hemp with only 0·0067% male plants and capable of spinning No. 12, a giant form of *Datura stramonium* with white flowers, rust-resistant forms of *Mentha piperita* and forms with vigorous growth, a black mustard with high mustard-oil content, a number of improved clones of raspberry, gooseberry and red currant and rootstocks of *Ribes aureum*, three improved willow hybrids together with a number of intraspecific and interspecific hybrids which are under observation and a high-yielding forage carrot of such quality that it can be used for culinary purposes. The following varieties have also been released: *Phalaris canariensis* 'Bernburger', distinguished by high yields of forage and seed and resistance to mildew, rust and early frosts as low as — 4° C.; *Bromus secalinus* 'Altmark', which gives high yields of seed and of fodder of good quality; *Lotus corniculatus* 'Bernburger', winter hardy and suitable for poor land; and *Poa palustris* 'Saaletal', very winter hardy, early and tender, and suitable for cold, damp soils. A number of potato crosses have been made, involving some 100,000 seedlings, which have been selected for resistance to virus, wart and *Phytophthora* and for tuber form and yield; 54 promising selections have been entered in the official tests.

Institut für Pflanzenzüchtung Gross-Lüsewitz.

Potato. Some of the eelworm-resistant seedings from crosses with *Solanum andigenum* show great promise and a method of testing nematode reaction on several thousand seedlings has been worked out.

No signs of maternal inheritance and very little heterosis have been observed in extensive crosses of *S. tuberosum.*

Race 4 of *Phytophthora infestans* has been shown to be now the predominant race; some new resistance genes have been found.

Institut für Pflanzenzüchtung Quedlinburg.

Vegetables. The institute is devoting special attention to breeding vegetable varieties suitable for forcing. A number of dwarf beans resistant to *Colletotrichum lindemuthianum* have been selected and others bear the pods above the leaves, thus facilitating mechanized picking. Cabbage strains equal to those of western Germany have been selected. A brown lettuce variety free from virus attack and suitable for outdoor cultivation, an early high-yielding heterotic cucumber and a form of *Scorzonera hispanica* resistant to mildew and free from bolting are among the achievements listed. Importance is attached to the breeding of *Brassica pekinensis* on account of its high biological value and polyploid forms suitable for growing in central Germany have been produced.

By the use of the texturemeter [XXVI, 1918] considerable differences in rate of ripening could be established between pea varieties, those with slow ripening being not always the latest to mature; it was found that certain late varieties ripened quickly and for this reason were unsuitable for canning.

New varieties of radish, lettuce, French bean, pea, strawberry and barley have been released.

Medicinal plants. Promising polyploids have been produced in *Mentha piperita, Anthemis nobilis, Digitalis lanata* and *Thymus vulgaris.* When the polyploids are produced by applying colchicine to vegetative tissue care is taken that the initial material shall as far as possible be heterozygous.

Institut für Pflanzenzüchtung Kleinwanzleben.

Barley. The winter barley Jutta is to replace Kleinwanzleben 12.

Sugar beet. Selection for monogerm beets has been carried out in natural populations and in crosses of sugar beet with *Beta lomatogona*; some of the latter families gave higher yields of sugar per unit area than Kleinwanzleben N. Large numbers of tetraploid sugar beets have been produced and crossed with diploids for the production of triploids. One haploid has been found in a large number of twin seedlings examined and some of the twins appear to be fully homozygous. Heterosis breeding is being applied to both sugar beet and mangels and a large number of inbred lines have been developed, some of them being distinguished by great uniformity.

Several biotypes of *Cercospora beticola* have been identified.

Yellows-resistant forms have been selected in crosses of sugar beet with *B. maritima.*

Partially pollen-sterile beets have been found and a search is now being made for fully pollen-sterile forms.

Forschungsstelle für Agrobiologie und Pflanzenzüchtung Gülzow-Güstrow.

Winter-rape selections better able to stand late sowing, early, short, high-yielding sunflowers, high-yielding potatoes resistant to virus degeneration and sugar beets that can be sown in autumn without bolting are among the results mentioned.

Cereals. Increased fertility has been attained in tetraploid rye by intercrossing several tetraploid lines.

In awned winter barleys an improvement in winter hardiness has been effected by selection.

Leguminous forage crops. A number of mutants have been produced in *Lupinus luteus* and *L. angustifolius* by X-ray treatment. In sweet yellow lupins a form with vigorous growth, greater branching and short hairs has been selected and in *L. albus* an early form that ripens in northern Germany even in unfavourable situations has been produced by crossing.

Selections of *Melilotus albus* and *M. dentatus* with low coumarin content have been obtained.

In red clover, selection has led to a reduction of the corolla tube to a length of 6·3 mm. and an improvement in yield of fodder and seed.

Bigerm mangels have been selected in material subjected to irradiation.

Forschungsstelle für Getreidezüchtung Kloster Hadmersleben.

Wheat. Winter and spring wheats combining yield, baking quality and nonshedding grain suitable for combine harvesting are under observation.

Oats. Oats with high yield, strong straw, uniform ripening of grain and straw and freedom from sprouting have been produced.

Rye. Some of the selections of rye with white grains have stronger straw than normal Petkus, which they exceed in yield by up to 7·8%. The results of intercrossing six strains to Petkus showed a yield increase of 8–10·5% in the best combinations in the F_1; the yield of the F_2 was equal to and that of the F_3 5% less than that of the parent strains. A strain of white-grained rye from Petkuser Kurz [Petkus Short] x Bulgarian land rye is very free from germination in the ear.

Barley. By crossing with Haisa mutants with strong straw some spring barleys suitable for combine harvesting have been produced and other selections are possessed of resistance to mildew race C; one six-rowed selection is very early, gives exceedingly high yields, stands well, is mildew resistant and suitable for combine harvesting.

Lupins. Strains of sweet *Lupinus albus* have been produced by hybridization which ripen 14 days before Nährquell [Source of Nourishment], give 20% more yield, withstand late sowing and stand well. A number of mutants have been produced by X rays. Eight sweet plants of *L. polyphyllus* have been selected and other selections are possessed of useful characters such as vigour of growth, resistance to mildew and frost and freedom from shedding.

Biologische Zentralanstalt Institut für Phytopathologie Naumburg.

Fruit trees. No effect was observed in applying the mentor method for improving resistance to mildew and woolly aphis in apples.

No indication of physiological specialization in *Peronospora viticola* in vines could be detected.

Biologische Zentralanstalt Forschungsstelle für Kartoffelkäfer-Bekämpfung Mühlhausen.

Potato. Examinations of a large number of Solanaceous plants showed that the supposed resistance of species such as *Solanum jamesii*, *S. macolae* and *S. polyadenium* to Colorado beetle cannot be ascribed to the alkaloids and glycosides they contain. True resistance in this sense was found only in certain forms of *S. demissum* and in members of the series *Glabrescentia*. Variation was however observed in the reaction of the insects too.

Institut für Forstwissenschaften Eberswalde.

Forest trees. Rust-resistant poplar hybrids have proved only partially resistant after artificial infection.

Crooked growth in pines has been shown to be an hereditary character.

Hybrids of *Betula verrucosa* x *B. pubescens* have been produced and all have $2n = 42$ chromosomes.

Institut für Forstwissenschaften Tharandt.

Forest trees. Two forms of Douglas fir have been identified, one of which is frost resistant and should make it possible to breed hardy types capable of growing in the continental areas of eastern Germany.

In poplar crosses short growth period invariably proved dominant to long. Hybrids of *Populus tremula* with *P. alba* or *P. canescens* were all inferior to *P. tremula* in branching. *P. berolinensis* was the highest in cellulose content, with 46·8% of pure cellulose.

HEGE, H.
Moderne Methoden der Pflanzenzüchtung.
(Modern methods of plant breeding).
Arb. dtsch. Landw.-Gesell. 1957 : **44** :
Pp. 132.

The lectures in this volume devoted to the newer methods now being applied by plant breeders were, with two exceptions, delivered at a meeting organized by the plant-breeding section of the German Agricultural Society. The other two were presented at a plant-breeders' meeting at Bad Dürkheim in 1956.

1245 *Rudorf, W. Entwicklungsphysiologie und Pflanzenzüchtung.* (*Developmental physiology and plant breeding*). (*pp. 7–21*).

The importance of such phenomena as dormancy of cereal grains or potatoes, and reaction to temperature and photoperiod in many crops is explained. Most of these reactions seem to be controlled by growth substances; varietal differences in reaction, and particularly in respect of the critical periods, exist and reference is made to segregation in respect of tuber production under long days in hybrids of the wild species *Solanum acaule* and *S. stoloniferum* with domestic potatoes, or in crosses between early and late domestic varieties. Early potatoes are those that have a critical photoperiod of about 14 hr. whereas in late varieties it lies between 15 and 16 hr.; this fact can be a help in selecting seedlings. In plants that are grown for the sake of vegetative portions rather than seed, as in forage plants or forest trees, selection of types that do not flower in the photoperiod of the area in which they are to be grown is suggested as a suitable method of breeding.

1246 *Lein, A. Qualitätsfragen bei der Züchtung von Weizen und Braugerste.* (*Questions of quality in breeding wheat and malting barley*). (*pp. 22–44*).

In discussing various aspects of the assessment of quality in bread wheat the opinion is expressed that the gluten quality number takes too little account of gluten quantity. The author uses a gluten index calculated as follows: $\sqrt{Q}.\ P.\ K^2$, where Q is the expansion number, P the test number and K the gluten percentage. Artificial mixtures of flour from four varieties representing different extremes of quality gave gluten indices linearly proportional to the proportions in the mixture. The gluten index was found to be fairly constant for different varieties in different years. Analyses of the winter wheats grown today in Germany show most of them to be deficient in gluten content though some of the newer varieties are excellent in gluten quality, as for example Taca, Werla, Carsten VI and Carsten VIII; the spring wheats are better, Koga II, Erli and Nordgau being mentioned as satisfactory in respect of both quantity and quality of gluten, though varieties of lower quality, such as Koga, are still popular since, it is pointed out, no extra price is paid for quality. Certain wheats introduced from Sweden and Switzerland surpass the German varieties in gluten content. The varieties with the highest gluten indices had however a slightly inferior yielding capacity, an increase of 50 in gluten index being associated with a reduction of 4–5% in grain yield.

Milling quality has also, it is thought, been given too little consideration by German wheat breeders: husk percentage for instance is lower in large round grains, whether these are conditioned by variety or by environment; the extraction percentage and the proportions of bran, meal and semolina vary widely with variety, as well as the quality known as grittiness. These properties are all determined by the endosperm structure, so that milling and baking quality must be to a certain extent correlated.

In connexion with malting quality in barley attention is called to the value of the apparatus now available for malting small samples of grain. Figures for extract obtained from such samples show the Bishop index to be quite unsuitable as a selection criterion. The extract figures can be supplemented by data on germination, water absorption, loss on malting, enzyme activity, protein solubility and influence of temperature. Some figures are referred to which indicate that high malting quality is not absolutely correlated with low husk percentage and hence inferior standing capacity.

1247 *Rudorf, W. Grundlagen und vereinfachte Methoden der Heterosiszüchtung.* (*Basis and simplified methods of heterosis breeding*). (*pp. 45–53*).

Experiments of Murphy [XII, 776] and Richey [XVII, 188] are cited in support of the dominant-allele hypothesis to explain heterosis; the method of convergent improvement as applied to maize breeding in the USA is explained and finally the production of synthetic hybrids is referred to. In this connexion the need for testing the inbred lines for combining ability is emphasized and the number of inbred lines recommended for producing the synthetics is from four to eight. In view of the high cost of producing double-cross hybrids the method of synthetics is thought more suitable for use in Germany for most crops, possible exceptions being rye and sugar beet.

1248 *Gaul, H. Stand der Mutationsforschung und ihre Bedeutung für die praktische Pflanzenzüchtung.* (*Position of mutation breeding and its importance for practical breeding*). (*pp. 54–71*).

In a review of the subject the speaker referred to the Brookhaven programme in the USA and to the production of mutants with improved yield and qualities in Sweden, Germany, Austria, Canada and the USA. The opinion is expressed that with highly-bred species the probabilities of obtaining improved mutants are about the same as from the older methods of cross breeding and selection. However, in plants that have not yet been highly bred the probabilities are much higher, instances cited being black currants [cf. XXVIII, 922] and other fruit trees, lupins, potatoes, *Phalaris arundinacea* [cf. XXVII, 4090] and soya bean [cf. XXVII, 3582]. It is pointed out that early-maturing mutants occur in nearly all plants that have been irradiated, and that physiological mutations of this sort can be expected more frequently than macromutations, if suitable techniques for detecting them can be devised. The combination of irradiation and wide crossing or chromosome duplication is also thought to offer promise in practical breeding.

Experiments by the speaker are described in which it was shown that certain treatments, such as heat, CO_2, H_2S and colchicine exert a protective effect against the action of X rays in inducing chromosome fragmentation and reducing fertility. These agents often increased the frequency of certain gene mutations, particularly the *viridis* group, whereas the frequency of the *albina* group was relatively unchanged. No difference was observed in the proportion of mutants obtained in the X_2 generations arising from X_1 ears of different grades of sterility, provided measures were taken to prevent the mutant tissue being swamped by normal tissue in plants of chimerical structure; this could be done by late sowing, close planting and low nitrogen. From these facts it is concluded that chromosome changes and gene mutations are largely independent of each other and that by using only the progeny of the most fertile ears the chances of obtaining useful mutants could be considerably enhanced.

1249 *Geidel, H. Zur Methodik des Feldversuches.* (*Methods of field experimentation*). (*pp. 72–81*).

Among the matters discussed in this general survey of existing problems are the advantages to be gained by working with absolute differences rather than percentages. It is pointed out that a comparison of the Mitscherlich type of treatment with the analysis of variance is only valid under certain conditions, for instance if there is soil homogeneity within the blocks. The best size of blocks and the number of individuals to be used can be determined only in relation to the variance and the degree of accuracy desired. Various difficulties in applying the F test are hinted at. Conditions must not be made so rigid in the experiment that it is no longer representative of conditions in practice. In varietal tests the same average can be attained by varieties with very different constitutions and graphical presentation of a number of factors in combination is recommended as a means of overcoming this difficulty. In his closing remarks the speaker urges experimentalists to consult the statistician before setting up an experiment rather than merely in interpreting the results.

1250 *Wienhues, F. Anlage und Auswertung von Mikroprüfungen.* (*Layout and interpretation of microtests*). (*pp. 82–96*).

The advantages of small-scale tests of large numbers of lines of which only small quantities of seed are available are expounded. The methods described comprise bunch planting of single-plant progenies and microdrill tests of the progenies of selected families, planted by a hand drill with 3–4 rows or by hand, in plots of 1 sq. m., with 2–4 replications in lattice designs in the following generation. Five examples are given. In the first, to test the combining ability of line 2012 from the wheat cross Medsched x Torcal, a comparison was made of 100 F_2 and F'_3 plants of crosses of the line with Heine VII, 50 F_2 and F'_3 plants of crosses with Werla and 100 F_2 plants of crosses with Derenburger Silber [Derenburg Silver], which showed that both in crosses and back crosses 10% of the families significantly exceeded the better parent, the greatest excess being in the crosses with Heine VII; the entire experiment, comprising over 800 plots, occupied only 1000 sq. m. The second experiment compared the results of multiple crosses with those of single crosses and back crosses; 40 F_2 families of crosses of line 6335 with Hauter II and Heine IV, 40 F'_3 families of a triple cross with the same varieties and 40 from the back cross with Hauter II were compared; the triple cross compared favourably with the other; in comparing the F_3 from selected F_2 families with the F_2 families themselves it was clear that selection had been more successful in the combination with Hauter II than that with Heine IV. In experiment 3 a fourfold lattice of 144 plots of 18 sq. m. was designed to show the variation in yield in the F_5 families of outstanding F_2 plants from a cross 8835 x Hauter II, in the parents and in F_2 families of a further cross of the same parents; clear differences in yield were evident between the lines and these appear to be due to relatively few factors; the maximum yields were the same in the two sets of hybrids and were equal to those of the best high-bred varieties, from which it is concluded that intensive selection work in successive generations would not have led to better results than selection in the F_2. Experiments 4 and 5 were designed to test general combining ability; in experiment 4 measurements were made of the F_1 yields of crosses of two wheat lines with various other varieties and also of the F_2 and F_3 populations and a number of selections; both positive and negative transgression was observed; line 8835, though inferior to line 5737 in most of the population yields, gave rise to some of the best combinations in the F_1 and the selections with the highest yields in later generations. In experiment 5 two lines were crossed with the same set of varieties and the F_1–F_4 generations were compared for winter hardiness; clear differences were revealed in 1955/56; in crosses with certain varieties such as Heine VII and Prima transgression was observed whilst with Derenburger Silber the hybrids were intermediate. The F_4 plants were hardier than the F_1 and a correlation between successive generations suggests that it should be possible to fix the heterosis.

1251 *Rundfeldt, H. Über die Vorteile einer erweiterten Auswertung von Feldversuchen.* (*The advantages of more extended calculation of the results of field trials*). (*pp. 97–118*).

An example is taken comprising tests of 6 spring-wheat varieties in 6 replications, at 6 different places in 3 successive years. Examination of the results shows very little regression of the variety variance on the varietal mean and the use of the absolute yields rather than percentages is recommended. The existence of significant interactions in this, as in the majority of such experiments, makes it necessary to take these into consideration in determining significance limits. The application of formulae by Smith, Yates, and Sprague and Federer for determining the optimum plot size and number of localities, years, plots and varieties in an experiment is illustrated and it is concluded that the 4–6 plots generally used in German experiments are too few and should be increased, if necessary at the expense of number of localities or years [cf. XXVII, 3616].

1252 *Schnell, F. W. Zur Auswertung und Wirksamkeit teilweise balancierter Gitteranlagen.* (*On the interpretation and efficiency of partially balanced lattice designs*). (*pp. 119–32*).

The principle of the incomplete-block experiment is explained and the calculation of the results of a partially balanced lattice is illustrated by examples; a simplified method of calculation applicable to the simple lattice is presented, consisting in analysing the differences in yield between the two replications rather than the yields themselves. The increase in precision by the use of a simple lattice as against a randomized block analysis in German maize trials in 1956 varied from 0 to 68% in different localities and for different characters, ear weight for instance showing more gain in precision than flowering time. In 1955, a less favourable year, gains in precision of over 250% were obtained.

1253 Das Institut für Kulturpflanzenforschung im Jahre 1956. (**The Institute for Research in Crop Plants in 1956**). Kulturpflanze, Berlin 1957 : **5** : 5–40.

The results referred to in the report include the production of economically valuable mutants by X-ray treatment in barley, tomatoes and soya bean, the hybridization of *Cucurbita foetidissima* with a wild form of *C. moschata*, the hybrid bearing fruit with empty seeds, and the selection of a rye with certain reciprocal chromosome translocations and distinguished by a high degree of self fertility.

A report is given of a collecting expedition in north and north-east China organized in conjunction with the Academia Sinica in May-September 1956. The material collected is being grown for further study at the institute at Gatersleben. The most interesting specimens included Chinese cabbage with and without heads, with thickened stems or thickened nodes, lettuce with thickened stems and various forms of cucumbers and egg plants.

1254 Országos Növényfajtakísérleti Intézet, Budapest. (**The National Institute for Crop Variety Testing, Budapest**). KisérlÜgy. Közl. 1956 : **50** : 287–305.

A brief account is presented of the history and organization of the above institute and of its main activities, which include varietal trials of field crops, horticultural plants and fruits, and the maintenance of a varietal collection.

1255 Az Északkelet-Magyarországi Mezőgazdasági Kísérleti Intézet. (**The Agricultural Research Institute of North-Eastern Hungary**). KisérlÜgy. Közl. 1956 : **50** : 350–60.

Information on the breeding work effected at the Kompolt Agricultural Experimental Institute, Hungary, and the crop varieties bred since 1918 is presented. Current work includes breeding for disease resistance in cereals, the development of monecious hemp and the use of heterosis in this crop and polycross breeding in lucerne and vetches.

1256 A Sopronhorpácsi Növénynemesítési és Növénytermesztési Kutató Intézet, Sopronhorpács. (**The Sopronhorpács Research Institute for Crop Breeding and Crop Production, Sopronhorpács**).
KisérlÜgy. Közl. 1956 : **50** : 361–84.

The breeding and other work of the institute at Sopronhorpács, Hungary, is briefly surveyed. Current work includes the study of breeding techniques and the development of disease-resistant crop varieties.

1257 Öntözési és Rizstermesztési Kutató Intézet, Szarvas. (**The Research Institute for Irrigation and Rice Growing, Szarvas**).
KisérlÜgy. Közl. 1956 : **50** : 385–403.

The work of this Hungarian institute includes testing rice varieties for blast resistance, the Rumanian line 45 and the Italian variety Precoce Allorio [Early Allorio] being outstanding in this respect, and breeding *Poa pratensis* and *Alopecurus pratensis*.

1258 Délalföldi Mezőgazdasági Kísérleti Intézet, Szeged. (**The Southern Plain Agricultural Experimental Institute, Szeged**).
KisérlÜgy. Közl. 1956 : **50** : 404–29.

In addition to other work breeding of *Capsicum*, linseed, hemp and grasses is carried out at the Szeged institute, Hungary. At the branch station at Bánkút, cereals, sunflower, castor oil plant and grasses are bred.

1259 Institut National de la Recherche Agronomique. Station Centrale de Génétique et d'Amélioration des Plantes. Rapport d'activité pour l'année 1955. (**National Institute of Agronomic Research. Central Station of Genetics and Plant Breeding. Report of activities for the year 1955**).
Pp. 127. (Mimeographed).

In addition to the work described below, varietal trials of wheat, oats, maize, barley, mangel, potato, flax, rape, *Phaseolus* and pea were carried out.

Wheat. An account is given of work on introducing the resistance of *Aegilops ventricosa* to *Cercosporella herpotrichoides* into *Aegilops* x *Triticum* hybrids. (*Ae. ventricosa* x *T. persicum*) x *Secale cereale* is entirely self sterile in the F_1; it is a triploid with $2n = 35$. Cytogenetical studies were carried out with descendants from the cross *Agropyron elongatum* x *Triticum vulgare* 'Géfir'; back crosses were made with Géfir, Étoile de Choisy [Choisy Star] and Vilmorin 27. It appears that in these crosses *Triticum* chromosomes increase with successive generations and *Agropyron* chromosomes decrease, accompanied by a loss in vigour. Some back crosses showed considerable resistance to *Puccinia glumarum*. There appeared to be a positive correlation between perenniality and chromosome number in descendants of (V27 x *A. glaucum*) x V27 and considerable differences were found in respect of fertility and disease resistance; selections from the R_2 and R_3 were resistant to rusts and especially to *P. triticina*. It is thought that crosses of *T. dicoccum*, *T. timopheevi* and *T. persicum* with *A. glaucum* may be useful as forage plants and trials are to be held with some amphidiploids. Other *Triticum* x *Agropyron* hybrids are also being studied. Mathematical studies on the mode of inheritance of yield components were carried out with diallel crosses between wheat varieties. Tests for resistance to *C. herpotrichoides* were performed on 56 varieties; a method of selection for this character is recommended. Newthatch was found resistant to smuts from various districts and the effect of smut infection on yield in susceptible and resistant varieties was studied. Varietal differences in resistance to rusts and *Septoria nodorum* are reported; selections from crosses involving Étoile de Choisy have shown promise in respect of yield, earliness, baking quality and resistance to cold, lodging and *P. graminis*; other promising selections include crosses between *T. ventricopheevi* and *T. vulgare*.

Oats. Varietal differences in susceptibility to smut, crown rust, mildew and *Septoria* are reported. Selection for resistance to these pathogens and to lodging was continued. Characters influencing yield were studied to find criteria for selection.

Maize. Selection for resistance to cold, lodging and disease is being carried out with material of European and American origin. Of the corneous types, descendents of Lacaune, such as INRA200, have shown most promise. Simple and complex hybrids were studied and some observations were made on the occurrence of male sterility.

Barley. The principal characters of some varieties, which were recently entered in the official list, are recorded. Lines from the crosses Bordia x Kenia 29 and Probstdorf x Kenia 1 gave high yields and are resistant to lodging. Crosses were effected between German and Russian winter varieties to produce lines resistant to mildew, *Puccinia simplex* and

Rhynchosporium. The inheritance of resistance to mildew and *P. simplex* was studied.

Forage plants. Breeding was carried out with vetch, fodder peas, lucerne, white clover, birdsfoot trefoil, perennial ryegrass, cocksfoot, timothy and meadow fescue. Early and late strains of vetch, winter forage peas resistant to cold and synthetic hybrids of lucerne are being developed. *Lolium perenne* x *Festuca pratensis* hybrids were studied.

Potato. The search for varieties with early tuberization and resistant to late blight, virus and common scab was continued. Interspecific crosses and crosses between cultivated varieties were made to determine the mode of inheritance of late blight resistance and to produce resistant strains.

Flax. Selection was continued with flax, linseed and dual-purpose flax.

Sugar beet. Varietal differences in resistance to virus yellows and *Cercospora beticola* are reported; the inheritance of *Cercospora* resistance is being studied. The development of monogerm forms and male-sterile forms was continued. Crosses with *B. maritima* produced forms resistant to virus yellows; the F_3 from *B. vulgaris* 4*n* x *B. lomatogona* 4*n* has shown considerable variation in morphological characters and resistance to yellows. New polyploids were produced and other polyploids were tested.

Rape. Selected lines from 47–3 (Hamburg x Alsace) were found promising.

Strawberry. A collection of varieties is being studied at Versailles in respect of yield, earliness, quality and resistance to viruses.

Asparagus. Male plants were found to be superior to female plants in yield and length of life; the populations studied were markedly heterogeneous.

Chicory. It was found that most of the plants studied were pollinated by insects and were self sterile.

Tomato. Varietal differences in yield, earliness, fruit size, and susceptibility to splitting are reported.

French bean. Selection is being carried out for resistance to viruses and anthracnose.

1260 Institut National de la Recherche Agronomique. Station Centrale de Génétique et d'Amélioration des Plantes. Rapport d'activité pour l'année 1956. (**National Institute of Agronomic Research. Central Station of Genetics and Plant Breeding. Report of activities for the year 1956**) : Pp. 109. (Mimeographed).

This report includes the results of varietal trials of wheat, oats, maize, barley, forage legumes, mangels, potatoes and flax.

Wheat. Cytogenetical studies were continued with a number of *Aegilops* x *Triticum* and *Triticum* x *Agropyron* hybrids. The eight French species of *Agropyron* have been classified into three groups: diploids, amphidiploids and segmental allopolyploids. The average chromosome configurations at metaphase I were recorded for two F_1 individuals from the cross *T. durum* 'Mahmoudi' x *A. intermedium*; the low percentage of allosyndetic pairing indicated that *Agropyron* genes may not easily be used for wheat improvement. Attempts are being made to produce new amphidiploids; (80 x Étoile de Choisy [Choisy Star]) and *T. monococcum* 4*n* were crossed with *A. intermedium.* The hybrid (*T. dicoccum* x *A. intermedium*) x *Secale cereale* indicates that there is no pairing between the chromosomes of *Secale* and those of *Agropyron* and *Triticum.* Varietal differences in yield and resistance to cold and *Septoria* (*Leptosphaeria*) *nodorum* are recorded. Selection was carried out for improved baking quality and resistance to rusts, *S. nodorum* and *Fusarium roseum* (*Gibberella zeae*). Lontoï, Kenya 338, Kärn II [Kernel II], and Closeaux were crossed with lines resistant to black rust. The results of genetical studies on cold resistance are reported. It was found that Vilmorin 27 may be vernalized by low temperatures but not Fylgia and Florence Aurore [Florence Dawn].

Oats. The principal characters of a number of oats recently included in the official list of approved varieties are recorded. Varietal differences in resistance to cold and crown rust are reported.

Maize. The general performance of a number of hybrids is reported; it is concluded that on the whole European x American hybrids are superior to combinations within either group. The hybrids of purely European origin gave better performance during a particularly cold year. Selection for resistance to low temperatures was continued and crosses were made between early-maturing lines tolerant of low temperatures and late-maturing lines with high yielding capacity. Attempts are being made to isolate haploid lines; they are to be treated with colchicine. At Versailles a number of French and American lines have shown male sterility and others are partially sterile.

Barley. Varietal differences in winter hardiness are recorded; the inheritance of winter hardiness is being studied in progeny from a cross between the hardy Vima 4–3 and the cold-susceptible line BK3. Resistance to *Erysiphe graminis* has been recorded for a number of varieties; Triple awn lemma and Monte Cristo CI1017 appear to be immune.

Forage Plants. Breeding with vetch, fodder peas, lucerne, cocksfoot, meadow fescue, perennial and Italian ryegrass and timothy is reported. Special attention has been given to the selection of cold-resistant strains. The inheritance of triple and quadruple cotyledons in lucerne is being studied. Amphidiploids were obtained by colchicine treatment of ryegrass x meadow fescue hybrids; chromosomes from the parental stocks showed considerable homology during meiosis in the amphidiploids.

Potato. Certain clones of *Solanum stoloniferum* resistant to the most virulent French races of late blight and clones of *S. acaule* resistant to virus X were treated with colchicine; the polyploids so obtained are to be crossed with *S. tuberosum*. Some of the progeny from Urgenta x Rosafolia and Furore x Rosafolia are superior to their parents in resistance to late blight. The inheritance of blight resistance is being studied in *S. demissum* and *S. demissum* x *S. tuberosum* hybrids. A virus designated F1 has been isolated for the first time in France.

Flax. CI687, CI687 x (Kostroma x Crésus) and Île de France were crossed with Wiera to obtain high-yielding lines resistant to lodging.

Sugar beet. Selection for resistance to virus yellows continued; *Beta maritima* x sugar beet hybrids, back crossed to the sugar beet parent, have produced some resistant lines. Tolerance of virus yellows appeared to be controlled by several genes. Amongst natural populations of *B. maritima* self sterility was found to be common. Data on yield and resistance to *Cercospora* are given for a number of varieties and new hybrids tested in 1956. The production of monogerm beets is discussed; studies on male sterility using type O plants were continued.

Rape. Data on varietal differences in yield, oil content and resistance to cold are given; certain lines from the variety Alsace and from crosses between Alsace and Hamburg have shown considerable resistance to cold. Some spring varieties were crossed with winter varieties. The components of yield were studied in a number of hybrids and lines.

Fruit. Observations are being made on apple, pear, apricot, cherry and peach varieties; special attention is given to winter hardiness.

Asparagus. Male plants were found to be more productive than female plants; attention is being given to the production of triploids and male varieties.

Chicory. Amongst a large number of plants studied, only a small percentage were found to be self fertile. Crosses were attempted between eight individuals of the Saint Martin variety; two kinds of cross incompatibility were found.

Tomato. The results of trials with a number of French and foreign varieties are discussed. Crosses between Supermarmande, Casaque rouge [Red Coat], St. Pierre and Vaillance [Valour] gave higher yields than the parents in the F_1 generation. Heterosis in tomatoes is being studied.

French bean. The inheritance of resistance to mosaic, black root and anthracnose is being studied.

1261 Istituto de Allevamento Vegetale per la Cerealicoltura, Bologna. Attività sperimentale 1947–1956. (**Cereal Breeding Institute, Bologna. Experimental activity, 1947-56**). 1957 : Pp. 30. (Mimeographed).

In this review of ten years of work mention is made of some of the best varieties produced by the institute, as well as its other activities. In addition to the work reported below, varietal trials have been made with French beans, peas, cauliflower, lettuce and potato.

Wheat. The area under the varieties Funo, Fiorello and Fortunato [cf. XIX, 628] is still extending, as are those of the more recent varieties Funone, Funotto and Falchetto [cf. XVII, 2750], the last-named being specially suited to conditions in southern Italy.

Some of the new hybrids with very short straw are thought promising, as are some bread wheats with branched ears.

Fiorello has proved superior to all others in baking quality, being followed by Funo, Funone and Funotto.

Oats. The varieties Astra and Angelica have both proved successful and have been joined by Ava, which has short strong straw and has given high yields.

Maize. In trials in central Italy, hybrids from the USA have all given higher yields than any Italian open-pollinated variety, except on high ground in dry years. Italian hybrids have given yields equal to the best American hybrids under relatively dry conditions.

Rice. The variety Rizzotto has proved extremely successful, being possessed of good standing capacity, yielding ability and grain quality, and a recent hybrid of Balilla x Vialone is also showing promise.

Forage plants. Two new varieties of forage sorghum, Sirri and Soave, have been produced, Soave being distinguished by vigour and speed of development, combined with high yield of leaf of good quality, the yield having reached 1115 c. of green matter per ha. without irrigation. Some lucerne selections are promising in respect of disease resistance, vegetative vigour, longevity and quality, and selection has been carried out with field beans and various other forage legumes.

Hemp. Observations on several thousand progenies of Italian and German hemp have shown the Italian hemps, though lower in fibre content, to be taller and better in fibre quality. It has not been possible to fix the monecious character, either in monecious types selected from Italian hemp or in those received from France.

Oil plants. Dwarf varieties of the castor-oil plant with indehiscent capsules have been selected and other selections are of medium stature, early, productive and relatively free from shedding.

Early-maturing sunflowers of short stature have also been selected.

Tomato. Some of the station's canning varieties, notably Prospero and Pirro, have given yields of over 1000 c. of fruit per ha. from land under irrigation. The table varieties Prezioso [Precious] and Pigmea [Pigmy], both dwarf and early ripening, are distinguished by the quality of their fruits; they are exceeded in these qualities, and in fruit size, by some new hybrids.

1262 Ponomarčuk, M. K. & Kordo, T. V.
(The plant breeding institutions taking part in the Soviet agriculture exhibition in 1957).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 58–63. [Russian].

Among the varieties exhibited special mention is made of the spring wheat Caesium 94, produced from a cross of *Triticum aestivum* 'Caesium 117' x *T. dicoccum*; it is resistant to drought, lodging, shedding, smut and brown rust and has excellent milling and baking qualities. Albidum 24, a complex hybrid from Lutescens 91 x Sarroga, is early, resistant to lodging, shedding, drought and loose and covered smuts. Hybrid 343, a winter wheat from crossing Ridit x Ukrainka, is described as resistant to cold, drought, lodging and shedding and good in baking quality. Other wheat varieties shown were Hordeiforme 94 [cf. 1537], Bezostaja 4 [Awnless 4] [cf. XXVI, 310] and various selections from it, and several others resistant to lodging or disease.

An interline maize hybrid, Krasnodar 1/49, is referred to as having yielded 48·6 c. of grain per ha. in the first generation, 48·5 c. in the second, 48·3 c. in the third and 47·8 c. in the fourth. Recent hybrids such as VIR281 [Institute of Plant Industry 281] and VIR267 have exceeded VIR42 by up to 5·5 c. per ha. in grain yield and several other stations exhibited maize hybrids, one of which matures 2–3 weeks before VIR25 in northerly situations.

Other exhibits included sunflowers with oil contents of up to 53·9% in the seeds, a hardy clover giving 2–3 cuts a year, a hardy timothy yielding up to 35 c. of hay per ha., improved varieties of sweet yellow lupin free from shedding and a sweet blue lupin resistant to drought, high temperatures and lodging.

1263 Minkevič, I. A.
(Achievements of Soviet breeders).
Nauk. pered. Opyt. sel'sk. Hozjajstv. 1957 : No. 10 : 10–14. [Russian].

Cereals. This survey of breeding work at various Soviet institutes mentions some new high-yielding wheats, among them spring hybrids from *Triticum durum* x *T. vulgare* and winter hybrids from *Secale* x *Triticum* and *Triticum* x *Agropyron*. The new maize hybrids include Dnepropetrovsk 56, which outyields the best hybrids in the Ukraine and northern Caucasus. Several maize populations developed at Krasnodar are as productive as the double cross VIR 42 and maintain heterosis for 2–3 years. Krasnodar 5, the most productive of the populations, may yield 70–80 c. grain per ha.

Potato. New midseason varieties resistant to diseases, in particular *Phytophthora* and *Synchytrium*, have been bred at the Potato Institute.

Cotton. New fine-fibred varieties with a lint length of 37–39 mm. are reported. Other varieties have a habit suitable for combine harvesting.

Sugar beet. R06, R0931 and R023 from Ramon', V020, V038 and V031 from Verhnjačka and U752 from Uladovo yield 2–5 c. more sugar per ha. than older varieties and have a 0·2–0·5% higher sugar content. Monogerm varieties, bred at Belaja Cerkov' and the Jaltuškovsk Breeding Centre, are mentioned.

Oil plants. Mention is made of new productive varieties of dual-purpose flax and hemp, the latter from Gluhov, and of *Orobanche*-resistant sunflower varieties with an oil content of 47–48%.

1264 Lobanov, P. P.
(Science in agriculture).
Priroda (Nature), Leningrad 1957 : No. 11 : 89–100. [Russian].

Mention is made of new varieties of industrial and crop plants bred in recent years in the USSR. Among them are the early-ripening rice variety Dubovskij 129, with a yield of 50–60 c. per ha.; the fine-fibred cotton variety 2IZ from Turkmenia, which has fibre 38–40 mm. long; flax varieties such as L1120 which produces 7–9 c. seed and 8–10 c. fibre per ha.; and the sunflower Saratov 351 which yields 60–100 kg. more oil per ha. than the older varieties in the arid south-eastern districts.

1265 Pisarev, V. E.
(**Plant-breeding work in Finland**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 75–76. [Russian].

As a result of growing the winter ryes Harmaa and Ensi [First], selections from local populations, and Visa and Oiva [Excellent], from hybridization with introduced varieties, the yield of winter rye has gone up by 10%. The improved wheats such as Antti and Vakka have taken winter wheat 200–300 km. further north and Sopu [Concord] and Hopea [Silver] spring wheats have taken this crop up to the 66th parallel; the newer varieties Touku [Sowing], Kiuru [Lark], Apu [Aid] and Terä [Blade] are still earlier in maturity, Apu being 12 days earlier than Diamant [Diamond]. The barley varieties Helmi, Olli and Tammi are all early and grow well in the north.

Several pea varieties are mentioned, Koivisto for its high quality and Sinikka and Ilo for protein content. Jakko potato is resistant to blight.

Promising tetraploids have been obtained in winter rye, red and crimson clover and wheat x rye hybrids.

1266 Selskapets representantskapsmøte 1957. **(Committee meeting of the society, 1957).**
Tidsskr. norske Landbr. 1957 : No. 11 : 131–66.

This report of the committee meeting of the Royal Society for the Welfare of Norway held in October 1957 includes an account by J. Rasten of trials in progress at Hellerud, concerned mainly with breeding material of potato, swede and turnip. A new swede, Bangholm Hellerud, has been developed; its root yield is somewhat lower than that of Bangholm Olsgård but its dry matter percentage is higher, it produces more leaves and it appears to be more resistant to club root.

Jord—Gröda—Djur. Aktuella praktiska resultat från svensk jordbruksforskning. Årsbok 1957. (**Soil—Crops—Animals. Current practical results in Swedish agricultural research. Yearbook 1957).**
Pp. 316.

1267 *Åkerberg, E. Förädlingen av strå- och trindsäd under perioden 1946–1956. (Breeding of cereals and pulses during the period 1946–1956). (pp. 73–84).*

This popular account of breeding methods used in Sweden and current breeding objectives includes a list of the varieties and strains of wheat, oats, barley, pea, vetch, field bean and lupin released during the above period by the Swedish Seed Association and the Weibullsholm Plant Breeding Institute. Breeding for disease resistance, adaptation to conditions in northern Sweden and suitability for combine harvesting are receiving increasing attention.

1268 *K., L. Nya tyska skördetrösk undersökningar. (New German investigations on combine harvesting). (p. 142).*

The attention of breeders is drawn to the desirability of breeding wheats in which the embryo is deeply embedded in the endosperm so that it is less readily damaged during threshing.

1269 Vad håller ni på med vid Utsädesföreningen och vad har ni i kikaren?—rundfråga till förädlare. (**What are you engaged on at the Seed Association and what have you in view ?—a question circulated to breeders**).
Allmänna Svenska Utsädesaktiebolaget, Svalöf (General Swedish Seed Co. Ltd., Svalöf) 1958 : 8–20.

In addition to previously reported information on the recent work of the Swedish Seed Association [cf. 119], the following results are mentioned among the answers to the above question.

Wheat. In winter wheat, crosses between Swedish and new central and western European material have shown promise in respect of productivity and straw stiffness but need to be selected for winter hardiness. A Russian spring wheat high in protein content is being used in attempts to breed varieties combining high yield with good quality.

Oats. A black oat from a cross involving Stormogul [Great Mogul] appears to be more productive than the latter.

Hemp. The new variety Mona [cf. XXVI, 2641] yields 9% more straw and 77% more seed than the standard Schurig.

1270 Tuinbouwkundig onderzoek. Jaarverslag 1956. (**Horticultural research. Annual report, 1956**).
Directie van de Tuinbouw en het Tuinbouwonderwijs 's-Gravenhage; Pp. 348.

In addition to the information summarized below, brief notes on breeding peach, *Vaccinium*, strawberry, grape, walnut, asparagus and some medicinal and culinary herbs are provided.

Lupin. No definite inhibitory effect of the expressed sap of resistant varieties upon *Fusarium oxysporum* f. *lupini* could be established.

Potato. Breeding for resistance to wart, blight and eelworm is in progress and numerous lines have been tested for virus resistance. The appearance of new physiological races of *Phytophthora infestans* after crossing cultivated varieties with *Solanum demissum* is thought to result from mutation and spread of the mutants on the new clones. Race 1 appears as a mutant of race 4 with a frequency of 1 in 100,000.

Tobacco. The cigarette tobacco Delcrest has been crossed with Purcucean with the aim of increasing the rate of early growth in the former. Delcrest has also been crossed with a vigorous Belgian selection of the Virginia type. Of three cigar types from Forchheim, two are of very good quality.

Medicinal plants. In *Datura stramonium* var. *inermis* the tetraploid has proved to be appreciably less fertile than the diploid, while in var. *tatula* both forms are equally fertile.

The hexaploid number $2n = 54$ in *Artemisia maritima* has been confirmed. Selection for essential oil content and quality is being carried out in *A. dracunculus*.

Colchicine-induced tetraploids of *Digitalis purpurea* and *Atropa belladonna* have been produced. Tetraploids of *D. lanata* are less fertile than diploids. Hybrids between inbreds of *D. purpurea* showed heterosis in leaf yield but not in glycoside content.

Pome fruits. Polyploid shoots have been induced by colchicine treatment in the apple Winston. The pear Oomskinderen has also been subjected to colchicine treatment. Crosses between pear and apple are being carried out. New apple varieties have all given lower yields than Jonathan, the best new variety being Rubens. Cultivated varieties have been crossed with scab-free crabs. Seedlings from Médaille d'or [Gold Medal] x Jonathan, Crawley Beauty x Jonathan and Crawley Beauty x Cox's Orange Pippin have been back-crossed to Jonathan and Cox's Orange Pippin.

In tests of apples, James Grieve, Dubbele Bellefleur [Double Bellflower], Dubbele Zoete Aagt [Double Sweet Aagt], Zoete Dobbert [Sweet Dobbert] and Antonovka showed resistance to *Phytophthora cactorum*.

Stone fruits. Pollen germination in some greenhouse plums proved to be extremely variable. Seedlings resistant to silver leaf have been selected. Shoots of the cherry Early Rivers have been treated with colchicine. Among seedlings undergoing tests, the triploids did not bear well but some large-fruited sweet cherries of good quality show promise. Embryo culture has been practised successfully on early cherries whose seeds normally germinate poorly or not at all.

Soft fruits. Tetraploid and mixoploid red currants have been induced by colchicine treatment of seeds.

Intervarietal differences in ascorbic acid content of black currant have been found and crosses between frost-resistant varieties have been effected.

Beetroot. Tetraploid and mixoploid plants have been developed through colchicine treatment of Egyptische platrond [Egyptian Oblate], Gladoro and Gribovo.

Brassica. Three physiological races of *Plasmodiophora brassicae* attacking (*a*) turnip and swede but not cabbage, (*b*) cabbage but not swede and (*c*) both cabbage and swede have been found. The cabbages Bindsachsen, Larsen's and Resistant Detroit have shown resistance to all three. Crossing of diploid and tetraploid winter turnip with various cabbage types is in progress. The cross *Raphanus* x *Brassica* has been effected.

In self pollination of cabbage, a low temperature of about 14° C. has been found favourable to anther development and siliqua formation but seed set tended to be low. Resistance to club root appears to be polygenically determined and behaves as a recessive character in crosses with susceptible lines.

Self pollination of Brussels sprouts is best effected in medium-sized buds before opening, while cross pollination gives the best seed set when carried out immediately before or immediately after opening. Among 28 strains tested for ring-spot resistance, line 53018 was distinguished by its very low level of infection.

The F_1 of a cross between annual and biennial Brussels sprouts showed that the annual character was dominant. F_1 Brussels sprouts progenies were more vigorous than their parents, their vigour being greater the more distant the relationship between the parents, but no F_1 progenies were more vigorous in growth than the stock material from which the parental lines had been selected.

The strong correlation observed between number of leaves and earliness in cauliflower may be of use in breeding for earliness. A male-sterile form obtained after open pollinations appears to be conditioned by a single recessive gene.

Radish. Colchicine-induced tetraploids have been developed from Ronde scharlakenrode [Round Scarlet], Cherry Belle and strain 6205. The most effective stage for self pollination is the bud stage, for cross pollination the time immediately before or immediately after opening.

Cucurbits. Crossing has been begun between Honey Dew and other melons in an attempt to combine the excellent qualities of the former with the high fruit set of the latter.

The American cucumber Barnes, supposed to be resistant to *Colletotrichum* (*Glomerella*) *lagenarium*, proved susceptible at about 20° C. under conditions of high humidity, as did the entire F_1 and F_2 progenies of its crosses with other varieties. Resistant selections in the F_3 of Guntruud x Barnes have been selfed. Infection of cucumbers with cucumber virus 1 resulted in the production of numerous male flowers and few female flowers and tendrils while infection with cucumber virus 2 produced the reverse effect.

Tomato. In breeding for earliness in Moneymaker, some very early types have been obtained in the first and second back-cross generations of Moneymaker x Mekor and Moneymaker x Earlinorth. The early Czech varieties Stupické Polni [Field Stupice] and Ostrava BII show little sensitivity to cold wet weather and are being used in breeding. Among F_5 intervarietal progenies for open-air cultivation, the best plants were obtained from Štambovoj [Determinate] x Market King. Varieties resistant to corky root have been found among *L. peruvianum*, *L. hirsutum* and *L. glandulosum*. In the F_1 of a cultivated variety x *L. hirsutum*, resistance was dominant, fruit colour showed intermediate inheritance and growth was heterotic. In later generations there was difficulty in combining desirable fruit colour and size with resistance. Attempts to cross *L. glandulosum* with *L. esculentum* are also being made.

Egg plant. F_1 hybrids from Sadohara x Florida Highbush and Sadohara x Lange Violette [Long Purple] were superior to Lange Violette in growth, fruit set and yield.

Broad bean. Varietal differences in seed colour after sterilization for canning are noted, Lux, line 33314 and Driemaal Wit [Triple White] remaining white while others turn brown.

Phaseolus. The varieties Processor and Bataaf have shown good wind resistance. It is proving possible to attain a high degree of anthracnose resistance by crossing random representatives of the type resistant to the α and δ group of physiological races with those of the type resistant to the β and γ group.

Pea. In studies of manganese deficiency in 126 varieties, some of the large-seeded varieties showed few or no symptoms, although within each variety marsh spot occurred, if at all, on the largest seeds.

1271 DE HAAN, H.
De veredeling van landbouwgewassen in haar binnen- en buitenlandse aspecten. (**The breeding of agricultural crops in its home and foreign aspects**).
Landbouwk. Tijdschr., Wageningen 1957 : **69** : 791–800.

In this survey of the technical and financial organization of breeding in the Netherlands, the chief topics discussed are: (1) breeding methods used; (2) the distribution of improved varieties; (3) costs of breeding; (4) maintenance of varieties; (5) breeders' emoluments, proceeding partly from breeders' premiums on bred varieties and partly also from returns on seed grown by others; (6) plant breeding establishments and national and international plant breeding journals; and (7) the importance of Netherlands varieties in other countries.

1272 HORBER, E.
Neue Untersuchungen über indirekte Bekämpfungsverfahren gegen Schädlinge im Feldbau. (**New research on indirect methods of pest control in agriculture**).
Schweiz. landw. Z. 1957 : **85** : 1337–49.

Differences in susceptibility to frit fly are reported from the Federal Agricultural Research Station, Zürich-Oerlikon, for some varieties of oat and winter barley. Single and double crosses have been made between inbred lines of maize which have shown resistance to *Pyrausta*. Forage plants are being tested for resistance to *Melolontha* larvae.

1273 Stations Fédérales d'Essais Agricoles, Lausanne. Rapport d'Activité 1956. (**Federal Agricultural Research Stations, Lausanne. Report of activity, 1956**).
Landw. Jb. Schweiz 1957 : **71** : 615–751.

In addition to the work listed below, mention is made of variety trials of wheat, oats, rye, maize, barley, *Festuca pratensis*, lucerne, sugar beet, potato, tobacco, apple, apricot, peach, grape, carrot, swede, beetroot, cabbage, asparagus and tomato.

Wheat. The hybridization programme involves crosses between wheat varieties from different countries, interspecific *Triticum* crosses and crosses of *Triticum* with *Secale*, *Aegilops* and *Agropyron*. Some *Triticum* x *Secale* hybrids have shown promising resistance to frost, but they mature late and are damaged by damp harvesting conditions. Lichti II and two lines from Oe263 (Huron x Newthatch) were found highly resistant to *Puccinia graminis*.

Rye. Studies continued on autotetraploid forms.

Barley. Some tetraploid spring varieties are being tested.

Tobacco. Selection for resistance to *Thielaviopsis* and virus Y continued.

1274 PANOS, D. A.
Introduction and breeding of food and fodder crops in Greece.
Euphytica, Wageningen 1957 : **6** : 255–58.

The part played by the Hellenic Agricultural Research Station at Larissa in agricultural improvement in Greece is indicated by an outline of work on introduction and breeding of various crops.

1275 DOGONADZE, R. I.
(**Plant breeding and seed production in Albania**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 70–74. [Russian].

Information is given on the wheat and rice varieties, mostly Italian, grown and also on the varieties of oats, barley, maize and various forage crops.

The local naked barley Vendi pa Hala [Hulless barley] is thought to be of interest for breeding on account of its earliness and large white grain resembling wheat.

1276 DOGONADZE, R. I.
(**Industrial and horticultural crops in the Albanian People's Republic**).
Agrobiologija (Agrobiology) 1957 : No. 3 : 151–56. [Russian].

Cotton. Trials of varieties recently introduced from Bulgaria and the USSR are reported.

Sugar beet. A number of Soviet varieties with high root and sugar yields, resistant to drought, bolting, black leg and *Cercospora beticola* are being tested.

Tobacco. Descriptions are given of the principal Albanian varieties, all oriental tobaccos of high quality. Some have short growth periods and show resistance to drought and diseases. Among the large-leaved forms, Šel'di is of the highest quality, but it lacks the aroma of Basma and other varieties with smaller leaf, mostly originating from other Balkan countries.

Tomato. A form found at Saniola, Korcë province, has large round fleshy fruits with smooth thin skin and few seeds. The flavour and transportability are good. The plants are tolerant of temperatures below zero and may yield up to 15 kg. each. Mention is made of other forms interesting for earliness and productiveness. They comprise the Albanian varieties Kerre and Serrek, a variety from China and three from Italy.

1277 CHENG, C.-F.
Crop improvement and seed distribution of upland food crops in Taiwan.
Chin.-Amer. Comm. rural Reconstr. Pl. Indust. Ser. 1956 : No. 2 : Pp. 34.

Wheat. Breeding for rust resistance is in progress; crosses have been made between introduced rust-resistant varieties and the locally adapted forms Taichung 31 and 32. Other breeding objectives are higher yield, adaptation to the Tainan area and high gluten content.

Sweet potato. The origin and characteristics of the principal varieties grown in Taiwan are described. The principal breeding objectives are greater earliness, improved yield and quality and the production of locally-adapted pigmented varieties. The following promising seedlings are being tested: P30 (Tainung 47 x Iron Wire), of similar adaptability to native varieties but higher yielding; a series of light-coloured varieties bred at the Chiayi experimental station; a series of deeply-pigmented varieties obtained by crossing Tainung varieties with Nancy Hall, Porto Rico and Oklahoma; the Hsin-Yu varieties 24, 25, 30 and 34, suitable for northern districts; and some new forms bred at the Taichung and Tainan district experimental stations.

Groundnut. New varieties are being bred by selection of and hybridization between local forms. Breeding for *Cercospora* resistance is based on hybridization between susceptible types and relatively resistant Virginia forms.

Soya bean. Improvement of this crop commenced in 1953, chiefly by selection of native forms and introduction of American varieties.

1278 Ponnaiya, B. W. X. & Subramaniam, A. **Modern trends in Indian agriculture: millets and pulses improvement.** Madras agric. J. 1957 : **44** : 380–84.

Some recent advances and current projects in the improvement of the above crops by breeding in India are briefly surveyed. The crops chiefly referred to are *Sorghum* spp., *Pennisetum typhoides*, *Eleusine coracana*, *Setaria italica*, *Cajanus indicus* and *Phaseolus mungo*.

Mysore Agricultural Calendar and Year Book 1956-57 : Pp. 218.

The most important work on crop improvement by breeding is reported in the following contributions:—

1279 *Agricultural Research Station, Bijapur.* (*pp.* 66–69).

Wheat. Crosses effected include a number between high-yielding local selections and Gaza, which has shown a high degree of resistance to races of rust occurring in India.

Pennisetum. The selections Bijapur 11–11–7–14, Golgeri 1–8–1 and 1–8–5 and Sindgi 3–16–13–9–4 of *P. typhoides*, now under district trial, have surpassed the improved strain N28–15 by 50% in yield.

Sorghum. Several strains, such as Gund 4 and Dagadi 40, have been developed by selection. Among the crosses now in the F_1, M–35–1 x Gund 4 shows promise.

Linseed. Local selections have been hybridized with NP strains.

Safflower. The new selections Annigeri 2–10–10 and Hungund 2 have outyielded the improved strain N630 by 20%. Crosses between local selections are under test.

Groundnut. Interstrain crosses and crosses with *Arachis nambiquarae* are under investigation.

Chickpea. Hybridization of *Cicer arietinum* has led to the development of high-yielding and large-seeded strains of which two, Badachana 7–23–1 and 7–30–1, have been released for trial.

Pigeon pea. Crosses of local selections with Burma and Kanpur types were effected with a view to increasing pod length. Hybrids between annual and perennial types are also being studied.

1280 *Agricultural Research Station, Mugad, Dharwar District.* (*pp.* 69–71).

Eleusine. Selection of indigenous material of *E. coracana* is receiving attention.

Rice. Advanced purple-leaved strains, developed to facilitate weeding out of wild rice, are undergoing large-scale trials. Strains combining finer grains, good yield and blast resistance are shortly expected to be released. Standard strains have been crossed with blast-resistant ones from Coimbatore, Madras. A table indicates the main features of the 11 commercial strains developed by pure-line selection.

1281 *Short note on the activities of the Agricultural Research Station, Nipani, Belgaum District.* (*pp.* 75–79).

Tobacco. Hybrids between Harrison Special and Bonanza are under test. In breeding of bidi tobacco, hybrids of S20 with various types were further studied in the attempt to develop a variety with improvements over S20 in yield and quality.

1282 *A comprehensive note on the agricultural research activities of the Agricultural Research Section, Arbhavi (Belgaum).* (*pp.* 87–91).

Maize. The single crosses I–5 x S–23 and L–5 x S–23 and three-way hybrid (I–5 x L–5) x S–23 have shown considerable superiority in yield over local maize in various trials. S–23 is of African origin; the other two parents are local inbreds.

Pigeon pea. Selections F-52 and F–18 combine resistance to wilt and high yield. Hybrids of *Atylosia lineata* x *Cajanus cajan* are being selected in the hope of developing a wilt-immune type.

1283 *A short note on the progress of work at the Paddy Breeding Station, Mangalore, South Kanara.* (*pp.* 69–97).

Rice. In addition to testing of introductions and selection of local varieties, hybridization has also been undertaken to remedy such defects as susceptibility to lodging and shedding in first-crop varieties. The problem of loss of seed viability in the second-crop variety Co.3 may shortly be solved since the hybrid selection 8363 has retained its viability when stored by the cultivators' method.

1284 *Kulkarni, V. K. & Tirumalacharya, D. K. Improved kharif jowar for Tungabhadra project area.* (*pp.* 98–99).

Selection 340K of the sorghum Palmudi was developed for the irrigated conditions now found in the arid region of the Raichur district as the result of the above project. Its semi-compact heads do not retain moisture and thus premature sprouting, which is a defect of the compact heads of the winter types customarily grown, is avoided. It also has the advantages of superiority in grain and fodder yield, sweet juicy stalks and, by reason of its earlier ripening, escapes from "sugary disease".

1285 *Brief account of the activities on the Agricultural Research Station, Mandya. (pp. 115–18).*

Eleusine. A strain named Aruna, superior to the standard K1 in yield and earliness, has been developed for irrigated conditions. Hybrid selections are under trial.

Cotton. A scheme for breeding long-stapled cotton is under way.

1286 *Priyavratha Rao, S. B. A brief note on Westerns cotton. (pp. 146–48).*

Work on the improvement of Westerns cotton (*Gossypium herbaceum*) at the Agricultural Research Station, Hagari, Bellary District, is briefly surveyed. Some advanced hybrid selections show superiority over the standard Westerns 1 in one or more characters.

1287 *Perennial cotton research work, Dharwar. (pp. 151–52).*

The results of intraspecific and interspecific hybridization carried out to develop perennial cottons resistant to diseases and pests for cultivation on waste lands and grasslands are surveyed [cf. XXVII, 1970].

1288 *Kaiwar, S. R. Present position of cotton improvement in Karnataka. (pp. 153–57).*

Progress achieved in the improvement of *G. herbaceum* and *G. hirsutum* for the different tracts in the Dharwar, Belgaum and Bijapur Districts is reviewed.

1289 *Scheme for the botanical improvement of Kumpta cotton at Bagalkot. (pp. 157–59).*

The work of the scheme for developing a variety to replace Jayadhar in the eastern tract of the former Bombay-Karnatak is described.

1290 *Scheme for improvement of pasture grasses and legumes. (pp. 170–73).*

Pennisetum. Hybrids of *P. typhoideum* ($2n = 14$) x *P. purpureum* ($2n = 28$), showing a wide range in variation, are mentioned. They are in most cases perennial and completely sterile. Two segregates have yielded two to three times more green fodder than the latter parent.

1291 *Crop varieties for different seasons and regions. (pp. 200–90).*

A table provides information on the main features of released varieties of sorghum, *Eleusine coracana* and other millets, sweet potato, cotton, groundnut, castor bean and pulses.

1292 Karamyšev, V. P.
(Agriculture in the Democratic Republic of Viêt-nam).
Zemledelie (Agriculture) 1957 : No. 10 : 78–86. [Russian].

Breeding work with rice and cotton is mentioned. The results include new rice varieties, four for cultivation under irrigation and two for rain-fed conditions.

1293 Laumont, P.
Visite des champs d'expériences de la Station Centrale d'essais de semences et d'amélioration des Plantes de Maison-Carrée. **(A visit to the experimental fields of the Central Station for Seed Testing and Plant Improvement at Maison Carrée).**
Élevage et Cultures, Alger 1956 : No. 90 : 1–4.

Brief reports are given of current breeding with wheat, oats, maize, barley, forage grasses and legumes, flax, sugar beet, rape, beans, peas and lentil.

1294 **Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya for 1955. Volume II—Record of investigation.** 1957 : Pp. 237.

Wheat. The varieties 354P3B2B and 356A12C were released [cf. XXVI, 3124]. Canadian Regent and the local varieties 354 and 321 were noteworthy for their resistance to stem rust, the prevalent races being K14 and the new races K15 and K16.

Maize. At both Njoro and Kitale, greater emphasis is being placed on the production of synthetics than hybrids; two synthetics have already been developed. Further progress is reported in transferring resistance to *Puccinia polysora* to local maize.

Barley. The crosses referred to in the previous report were selected in the F_3 [cf. XXVI, 3096].

Potato. Four of the late-blight resistant hybrids obtained from the Scottish Plant Breeding Station are to be distributed: E/52 [1664a(12)], K/52 [1812a(8)], C/53 [1521d(24)] and J/53 [1943de(1)]. Their genotypes are respectively R_1R_2, R_3R_4, $R_1R_2R_3$ and R_1R_2.

Coffee. SL28 and SL29, with total yields of 31·18 and 30·94 cwt. of clean coffee per acre over the period 1953–55, respectively, have given the best performance among the selections tested. Investigations on varietal reactions to *Colletotrichum coffeanum* are reported [cf. XXVII, 3340]. Collections of *Hemileia vastatrix* from Kenya have been identified at the rust research station in Portugal [cf. XXVII, 3870] as representing three physiological races.

Pyrethrum. Further single-plant selections were obtained from hybrids and Dalmatian material. The total number of clones now available for crossing or seed issue is 298. Hybrids C43, M9, C51 and C79 again gave a good performance in extensive yield trials; several other hybrids were also promising. Problems of pollination and seed setting were further investigated. Cross pollination is essential for the production of viable seeds, the low percentage of which may be due to insufficiency of pollinating insects.

1295 Report and accounts of the Tanganyika Agricultural Corporation for 1955-56 (1957) : Pp. 107.

Maize. Breeding for rust resistance in the local Katambili maize was continued. Vigorous rust-resistant synthetics are ready for field testing.

Sorghum. Some lines from the F_4 generation of Swaziland P41 x UK are superior to Swaziland P41 with regard to uniformity, height and straw strength, but the grain is not cornaceous. Breeding for cornaceous types resistant to grain weevil is to be continued. Progeny from the cross Dobbs x (Dobbs x Wine) are being retained for further selection; the latter cross has proved disappointing. Msumbiji crosses produced at Ukiriguri are expected to provide better material. White Dobbs II and Red Dobbs gave the highest yields in the variety trials.

Sunflower. Nine lines of the West Nile sunflower from the second generation of selfing have shown some self fertility; they are being used to produce synthetic varieties.

Cashew. The relationship of specific gravity of nut to germination behaviour was studied. It is suggested that a system of grading according to specific gravity may be of value in seed selection.

Soya bean. Some selections from Hernon 237 and Mis 28EB are promising; in the trials of dwarf short-season varieties, Soya 27 and Light Speckled gave high yields. Crosses were made between tall long-season varieties, with pods borne on both the central stem and side branches, and dwarf short-season types, with pods borne only on the main stem.

1296 Report of the Secretary to the Federal Ministry of Agriculture Federation of Rhodesia and Nyasaland, for the year ended 30th September, 1956 (1957) : Pp. 167.

Wheat. Hybridization was initiated to develop varieties able to withstand the severe rust attack during the rainy season on the high veld.

Maize. Selfs of Hickory King, Salisbury White and Southern Cross were selected for resistance to leaf blight (*Helminthosporium turcicum*) at the Salisbury Experiment Station. Breeding was extended to yellow maize, in view of possible export demand and the fact that yellow lines from Natal provide the best sources of resistance to leaf blight. Mexican and Colombian lines were apparently better adapted than North American. Advanced inbred lines were tested for specific combining ability with the single cross N3–1–4–9 x A5–7–6. Many showed promise that they would combine with this productive hybrid to produce double crosses capable of yields at least no lower than those of N3–1–4–9 x A5–7–6.

Information was obtained on the reaction of open-pollinated varieties, inbreds and hybrids to cob-rotting diseases.

Cotton. Transference of B_{6m} from BAR4/18 to *Gossypium hirsutum* has reached the stage of second back cross. Albar 51, the F_3 of Albar 51 x (MU8A x $BP52^2$) and back crosses to Albar 51 and Albar 49 were selected for resistance to bacterial blight at several stages of development; the remaining plants which showed susceptibility to jassid were discarded. Single plants were then selected in the field and evaluated for halo length and lint and seed indices. Most of the 14 plants finally selected were derived from Albar 51 and its direct cross. U4 progenies were selected for jassid resistance, yield and seed cotton characters. Bacterial-blight susceptible selections of MU8 x $BP52^2$, MU8A x BP52 and MU8A x Acala are being retained, mainly on account of their high yielding capacity, and will be used in crosses with Albar. Strain S52/36, a selection from 9L34, is to be multiplied as a substitute for its parent.

Sunn hemp. Some crosses of sunn hemp with other species of *Crotalaria* known to have greater resistance to disease were successful.

1297 81st Annual Report of the Ontario Agricultural College and Experimental Farm, 1956 (1957) : Pp. 88.

Barley. Tetraploid lines differing widely in fertility were developed from colchicine-treated material of OAC21, Brant and Montcalm, those from OAC21 being the most fertile. Over a wide range of sowing rates, rate of tillering had a greater effect on grain yield than number of kernels per spike or kernel weight and is considered to be a useful criterion in early-generation selection.

Potato. Seedling 1711–9, licensed under the name of Huron, is suitable for the late crop in southern Ontario, its chief advantages being high yield, high content of dry matter and scab resistance.

Cucumber. The pickling cucumber Hycrop Hybrid, introduced as a cold-resistant type in 1952, is being replaced under the same name by a similar type possessing resistance to mosaic and scab and partial resistance to mildew. Another pickling type, Hybrid Long Green, has also been introduced. Compared with Long Green, it has a tender skin, less seediness, a better colour and greater vigour and disease resistance.

Tomato. Progress has been made in the chromosomal mapping of monogenic mutants.

About 50 F_1 purple-fruited hybrids ranged in colour-index values from 70 to 111 and in ascorbic acid content from 11·7 to 41·3 mg. per 100 g.

Induction of mutations by use of radioactive material is being investigated.

Lima bean. A derivative of (Henderson Bush x Red Butterpea) x White Butterpea, with green cotyledons, is early and possesses some resistance to cold soil.

1298 Rapport du Ministre de l'Agriculture de la Province de Québec pour l'année finissant le 31 mars 1957. (**The Report from the Minister of Agriculture of the Province of Quebec for the year ending 31 March 1957**) : Pp. 290.

In addition to the items listed below, variety trials of maize, strawberry, onion and tomato are mentioned.

Potato. Selection for resistance to leaf-roll virus was continued.

Tobacco. Promising lines of both cigar and cigarette quality were obtained; some new crosses were made.

Grape. The breeding of hardy hybrids is in progress; some direct bearers, of French origin, have shown promise.

Tomato. A new variety, Québec 314, is mentioned; it is high yielding and earlier than Bounty, which it may replace.

Sweet corn. A new variety, Laval II, is ready for release; it is early and has larger ears than Laval I.

1299 Rapport du Ministre de l'Agriculture de la Province de Québec pour l'année finissant le 31 Mars 1956. (**Report from the Minister of Agriculture of the Province of Quebec for the year ending 31 March 1956**) : Pp. 243.

Breeding and variety trials of maize, potato, tobacco, pome and stone fruits, grape, melon and onion are mentioned.

1300 Memoria. Contribución del MAI al desarrollo agrícola industrial en 1956. (**Report. Contribution of the Ministry of Agriculture and Industries [of Costa Rica] to the development of agricultural industry in 1956**). 1957 : Pp. 116.

In addition to tests of forage legumes and grasses and potato, the following breeding work is reported.

Maize. Among new maizes now being commercially sown are the white hybrid Rocamex H–501, the white varieties Rocamex V–520C, Eto Blanco and I–451 and the yellow varieties Amarillo Salvadoreño [Salvador Yellow], I–452 and Mayorbela. Crosses in all combinations have been effected among ten white and ten yellow varieties.

Rice. Selection for resistance to lodging and fungal diseases is in progress.

Coffee. In preliminary tests, Híbrido Tico and Caturra have proved outstanding in yield, Villalobos Bourbon in yield and resistance to red spider and Arábigo [Arabica] and Villalobos Arábigo in quality and yield.

Cacao. Hybridization and varietal selection are being carried out. Disease-resistant material is being compared with recognized clones.

Abstracts of the Golden Anniversary Meetings of the American Society of Agronomy, Atlanta, Georgia 1957 : Pp. 84.

1301 *Abrams, R. & Frey, K. J. Effect of recurrent X-radiation on germination and seedling vigor in oats.* (*p. 50*).

When seeds of six varieties were treated with 25,000 r. for one, two and three generations, germination percentage was reduced cumulatively whereas vigour was lowest in the X_1 seedlings. The cumulative effects were apparently chromosomal in origin; possible intrachromosomal linkages were weakened by the first treatment to such an extent that less energy was required to cause lethal chromosomal aberrations in subsequent cycles of radiation.

1302 *Ashri, A. & Knowles, P. F. Cytogenetics of safflower* (*Carthamus*) *species and their hybrids.* (*p. 50*).

Chiefly on the basis of chromosome number, species of *Carthamus* were grouped into the following sections: I, *C. arborescens*, *C. oxycantha*, *C. palaestinus* and *C. tinctorius*, $2n = 24$; II, *C. alexandrinus*, *C. glaucus*, *C. syriacus* and *C. tenuis*, $2n = 20$; III, *C. lanatus*, $2n = 44$; and

IV, *C. baeticus*, $2n = 64$. Members of I are found chiefly in western Asia; hybrids between them are fertile, with complete chromosome pairing at meiosis. Species belonging to II inhabit the eastern Mediterranean region. Their flowers contain anthocyanin whereas those of I lack anthocyanin. Interrelationships within II have not been studied. *C. lanatus* is probably an allopolyploid between species belonging to I and II; it is found in the areas occupied by these two sections. *C. baeticus*, occurring in the Iberian Peninsula and North Africa, probably had *C. lanatus* as one of its ancestors, the other being a member of II. Hybrids between species in I and II, I and III, and II and III are sterile. Hybrids between *C. lanatus* and *C. baeticus* are partially fertile.

1303 *Baltensperger, A. A. & Kalton, R. R. Variability in reed canarygrass,* Phalaris arundinacea *L. (p. 50).*

The usefulness of *Ph. arundinacea* in the USA is limited by poor seed production and questionable forage quality. Many collections, mostly from the north-central region, are therefore being evaluated in various types of planting with the aim of finding material suitable for breeding. Preliminary data are briefly given on variability in several agronomic characters.

1304 *Beard, B. H. & Caldecott, R. S. Radiation techniques of potential significance in plant breeding. (p. 50).*

Single treatments of seeds by ionizing radiations appear to be most effective in inducing (1) mutation in order to supplement usual methods of breeding, (2) duplication of a specific locus to establish a type of permanent heterosis and (3) separation of desirable and undesirable germplasm as is sometimes necessary in interspecific and intergeneric hybrids. Recurrent irradiation of seeds, consisting of a series of treatments in selected subsequent generations, may be used to procure such changes in the genetic system as the following. (1) The chromatin may be rearranged at the diploid level to such an extent that the F_1 between nonirradiated and selected treated plants shows little or no pairing; multivalent pairing may be reduced or eliminated in induced tetraploids derived from such an F_1 and enhanced fertility thus be secured. (2) Polyploids may be "diploidized" by mutation of loci on homeologous chromosomes governing the same biochemical function; such diploidization could result in permanent heterosis in self-pollinating polyploids. The authors refer to a scheme depicting the second approach and the success so far achieved with hexaploid oats.

1305 *Brewbaker, J. L. Self-compatibility in tetraploid strains of Alsike clover. (p. 51).*

Out of the 410 tetraploids pollinated, 231 were self fertile, the five strains represented ranging from 39 to 84% in self fertility. Competitive interaction of *S* alleles in the pollen was responsible for self fertility. Inbreeding depression resulting from selfing is likely to be an important problem in the utilization of tetraploids of Alsike clover; methods of eliminating self fertility have therefore received attention.

1306 *Burdick, A. D. Theoretical and experimental considerations of the induction of dominant beneficial factors by irradiation. (p. 51).*

It is suggested that the frequency of mutations recovered from mature R_1 plants may not tally with the frequency of their induction in the seed meristem, owing to the outcome of intercellular competition, depending on whether a dominant mutation is beneficial or disadvantageous for growth.

Experiments on the tomato have indicated that favourable dominant mutations may be induced, recovered and identified if (1) seeds are irradiated, (2) the F_1 plants are used as males in back crossing to the unirradiated controls, (3) the back-cross progenies are evaluated in replicated experiments and (4) the mutations sought affect traits, such as earliness, which characteristically exhibit heterosis. [Cf. XXVII, 2387].

1307 *Caldecott, R. S., Beard, B. H. & Konzak, C. F. The influence of ion density and environmental factors on the radiosensitivity of seeds. I. The relation of water content of the seed and the conditions of hydration to observed injury. (p. 51).*

"A comparison of the effects of X-rays and thermal neutrons on dormant seeds of barley subjected to the irradiations under laboratory conditions has shown that higher mutation and aberration frequencies per unit survival can be obtained from neutron bombardment than from X-radiation. Studies with X-rays designed to elucidate the biophysical implications of the manner in which X-rays affect seeds have resulted in the conclusion that their tolerance is subject to modification by a number of conditions. Two of the more important are as follows: (1) Equilibration of the water content of the resting seed by storage at different relative humidities prior to irradiation, there being an inverse relationship between X-ray tolerance and water content evidenced when the seeds are germinated aerobically. (2) Post treatment hydration in the presence of oxygen or nitrogen, the greatest apparent radiosensitivity occurring in seeds with a low embryo water content that are hydrated in the presence of oxygen immediately following X-radiation preparatory to seeding."

1308 *Coffman, F. A. A southern crop is moving north. (p. 51).*

Reasons for the expansion of winter-oat cultivation in the USA are discussed, reference being made to the role of breeding.

1309 *Coleman, O. H. & Dean, J. L. The inheritance of resistance to rust in sorgo. (p. 52).*

Data from crosses of the susceptible varieties Rex and Planter with resistant MN960 indicated that resistance to rust (*Puccinia purpurea*) is controlled by a single dominant gene, *Pu*. Rust resistance was independent of plant colour as conditioned by the gene pair *Pp*, glossy *vs.* chalky seed coat (*Ss*) and subcoat colour (*Bb*).

1310 *Cooper, W. E. & Gregory, W. C. Irradiation induced leaf spot and southern stem rot resistance in the peanut. (p. 52).*

Mutants showing increased or decreased resistance to *Cercospora arachidicola* and *C. personata* have been induced by X irradiation; mutants with greater resistance to *Sclerotium* (*Pellicularia*) *rolfsii* have also been obtained [cf. Abst. 195].

1311 *Drolsom, P. N., Moore, E. L. & Graham, T. W. Inheritance of resistance to root knot in flue-cured tobacco. (p. 52).*

Data from plantings in the greenhouse and field indicated that resistance to *Meloidogyne incognita* var. *acrita* depended upon a single dominant factor.

1312 *Elliott, F. C. Radiation-induced translocations in plant breeding. (p. 52).*

In heterozygous intraspecific hybrid material the possibilities of using radiation-induced translocations include the following. (1) Simplification of the inheritance of characteristics such as strong types of disease resistance which involve additive genes may be accomplished by translocation of such genes to the same chromosome. (2) Specific recombinations of segments may be induced in crops in which the structural arrangements characterizing the genetic system suppress recombination. (3) In cases uncomplicated by pleiotropy, breakage of deleterious linkages may be desirable.

In interspecific and intergeneric hybrids translocations of simply-inherited characters such as disease resistance are possible if (1) fertility is found in the F_1 and back-cross generations and (2) the recombination potential is in general seriously restricted. Translocation of stem-rust resistance from *Agropyron elongatum* to common wheat is referred to as an example. The numbers of radiation-induced breaks may be markedly increased through combined treatments involving suboptimum quantities of Ca and Mg.

1313 *Everson, E. H. Inheritance of milling quality in wheat. (pp. 52–53).*

Milling quality was evaluated on the basis of bran weight, since it had been found that varieties poor in quality had a much greater increase in bran weight at high milling moisture than varieties having good quality. Using 5 g. samples, the mean bran weights of CI13253 (Norin 10 [Ministry of Agriculture and Forestry 10] x Brevor 14), Burt (CI12696), the F_1 of the cross between these two wheats, the F_2, the back cross to CI13253 and the back cross to Burt were found to be 20·09, 16·57, 19·02, 19·10, 19·88 and 17·97 dg. respectively. Variances were respectively 1·207, 0·920, 1·016, 2·780, 1·790 and 1·883. The parents differed by a large number of genes governing milling quality, with poor quality partially dominant. Heritability of the additive component of the genetic variance in the F_2 was estimated as 35·5%.

1314 *Forbes, I. (Jun.) & Burton, G. W. The induction and some effects of autotetraploidy in Pensacola Bahiagrass,* Paspalum notatum *var.* saurae *Parodi. (p. 53).*

Hybrids ($2n = 30$) between the sexual and allogamous variety Pensacola ($2n = 20$) and apomictic common Bahia grass ($2n = 40$) were apomictic. Data on meiosis indicated that the latter is an autotetraploid, closely related to the former. Diploid-tetraploid chimeras were induced by treating seeds of chance hybrids of Pensacola with colchicine, the most effective treatments being 0·4 and 0·8% for 6 hr. and 0·2, 0·4 and 0·8% for 48 hr. Tetraploids and diploids propagated from the chimeras were tested in the field. With their average performance expressed as percentages of the diploids, the tetraploids surpassed the diploids in leaf width and thickness, diameter of seed-bearing culms, length of anther, width and length of floret, 1000-seed weight, moisture content of forage and spring growth but were markedly inferior in seed set and forage yield. "Significant ploidy x genotype interactions were measured for some characteristics, indicating that selection among genotypes would be effective".

1315 *Force, D. W. & Pfeifer, R. P. Growth rates of winter wheat seedlings as affected by drought, temperature, and heritable selections.* (*p. 53*).

Of the wheats tested as seedlings under controlled conditions of drought and temperature at the Wyoming Agricultural Experiment Station, Minter, Yogo and WS/650 were resistant to drought and WS/21, WS/89 and Concho susceptible. Highly significant values of interaction were found for lines x drought, lines x temperature and lines x temperature x drought. Generally, while under drought conditions, a drought-susceptible line grew only within a limited range of temperatures while a resistant line grew within a wide range.

1316 *Frankes, R. V. & Cowan, J. R. Dry matter and protein heritability estimates in tall fescue* (Festuca arundinaceae, *Schreb*). (*p. 53*).

A population representing 20 genotypes, selected at random from five different genetic sources, was studied in two experiments, each consisting of replicated clones harvested over a three-year period. Experiment (1) was designed to permit sampling at different stages of maturity. In experiment (2) the forage was harvested each time it reached an early-pasture stage. The genotypes differed in both dry-matter and crude-protein production, any given genotype showing annual differences. In general, heritability estimates were high for both properties in (1) and (2), with the exception of the third year in (2). Genetic potentials were computed, assuming the selection of the top 5% of the population. For (1) the mean estimates for increase in percentage of the mean for dry matter was 30·39% and for crude protein 28·40%; the corresponding estimates for (2) were 30·60% and 32·79%.

1317 *Gorz, H. J. & Haskins, F. A. Rapid fluorometric tests for free and bound coumarin in sweetclover.* (*p. 53*).

"In the tube method, approximately one-fourth of a young leaflet is autoclaved for 15 minutes in 1 ml. H_2O. The leaflet is removed, 1 ml. of 5N NaOH is added and the solution is exposed to ultraviolet light for 15 minutes. Free coumarin is estimated by comparing the fluorescence in each tube with a set of coumarin standards. The basic solutions are then autoclaved for 30 minutes, cooled, irradiated and compared again with the standards. Increases in fluorescence caused by autoclaving are due to release of coumarin from the bound form. The procedure thus permits classification of plants as 'free-', or 'low-coumarin.' Agreement of results from this method with those from quantitative fluorometric assays is excellent.

"In the paper method, a small sample of leaf tissue is macerated on Whatman No. 1 filter paper and a drop of 2.5N NaOH is added. Free coumarin is immediately detectable under ultraviolet light. Heating the sample sheets (base added) overnight at 100° C. appears to release some of the bound coumarin, but results from this part of the paper test, although promising, have not been completely satisfactory."

1318 *Grafius, J. E. & Kiesling, R. L. Vector representation of biologic fields of force in oats and barley.* (*p. 54*).

If a set of varieties is grown in a series of environments and the percentage of yield (or some other characteristic) of each variety at each location is calculated, then the range of genotypic response to each environment can be represented as a unit vector. Responses to different environmental factors can be compared by ascertaining the angles between the vectors.

1319 *Gregory, W. C. The genetical foundations for mutation breeding.* (*p. 54*).

Observations on the evolution of natural populations with various systems of breeding, together with the increasing success in improving crops by induction of mutations, suggest that mutability may itself have been favoured in plant evolution since it provides the evolutionary opportunity for organisms infrequently crossed or seldom reproduced by seed. "In the present paper the quantitative variation of complex characters, the F_1 and F_2 heterosis therein, and the grade variation in morphological mutants together with the phenotypic stability of irradiated populations of peanuts are discussed in conjunction with significant conclusions drawn from the studies of other irradiated and natural populations. These are presented in explanation of a working hypothesis concerning the mutation breeding of certain crop plants."

1320 *Heggestad, H. E. & Grosso, J. Reaction of parental plants and F_1 progeny from 41 crosses in tobacco to root-knot nematode.* (*p. 54*).

Plant 56–1010 was more effective in transmitting resistance to *Meloidogyne incognita* var. *acrita* to its F_1 hybrid progeny than five other single-plant selections. Only progenies obtained by selfing 56–1010 or crossing it with other resistant plants included some individuals free from galling under field conditions. No plants in the F_1 of 56–1010 x susceptible Coker 139 remained free from galling; resistance was therefore incompletely dominant. Roots of plants remaining free of galls from transplantation until maturity developed galling to varying degrees after 4 months from the time of being brought into the greenhouse as stubble. Expression of resistance may thus be associated with age and physiology.

1321 *Hoen, K. & Andrew, R. H. Performance of corn hybrids with various ratios of flint-dent germplasm.* (*p. 54*).

Using three flint and three dent lines in the S_2 and S_3, as well as the respective open-pollinated flint and synthetic dent parents, 12 top, 15 single, 18 three-way and 27 double crosses were made. The hybrids and parents were tested for two years at two centres in Wisconsin. "Indices were determined for plant height, internode number, tiller number, shank length, husk leaf blades, silking date, number of kernel rows, kernel weight, shelling percent, and moisture at harvest. Correlations of yield with various morphological characters were calculated on an electronic-digit computor. These associations are discussed in the light of genetic divergence, homozygosity and order of combination of the parent material."

1322 *Hoven, A. W. Bulk emasculation by high temperatures in annual bluegrass,* Poa annua *L.* (*p. 55*).

High night temperature was essential for anther abortion. With a maximum day temperature of 29° C. and minimum night temperature of 20° C., panicles which emerged 11–19 days after the beginning of the treatment had either shrivelled anthers with nonfunctional pollen or no anthers, five pure lines showing a similar response. Good seed set was obtained when plants with aborted anthers were fertilized by foreign pollen.

1323 *Jenkins, M. T. & Robert, A. L. Evaluation of the breeding potential of inbred lines of corn resistant to the leaf blight caused by* Helminthosporium turcicum. (*p. 55*).

The leaf-blight reactions of 16 resistant inbreds of maize, 3 susceptible testers, and the 48 F_1 and 48 F_2 populations from crosses between the lines and testers were determined at Belle Glade, Fla. All plants were scored individually. Analysis of data on the parents indicated highly significant differences in reaction among the lines and among the testers. Analysis of variance for F_1 and F_2 data also showed that the differences between lines and between testers and the interaction of lines x testers were highly significant. The mean scores of the F_2 populations were indicative of more resistance than was expected, evidence of interaction among the genes for resistance thus being provided. CI90A and GA440 were superior to the other lines as parents conferring resistance.

1324 *Jugenheimer, R. W. Performance and variability of various types of corn hybrids.* (*p. 55*).

Data were obtained on the performance and variability of four widely-used inbreds (Hy, L317, WF9 and 38–11), six types of hybrids involving these inbreds and an open-pollinated variety at the Illinois Agricultural Experiment Station. The inbreds were crossed in all possible combinations, giving (1) 6 single hybrids, (2) 12 three-way hybrids, (3) 12 back crosses, (4) 12 single x back-cross combinations, (5) 3 double hybrids and (6) 6 top crosses. Highest yields were obtained from (1), (3) and (4). The inbred lines were more variable than the hybrids in weight, length and height of the ear, but were very uniform in kernel-row number. If hybrids with greater uniformity than double crosses were desired, production of the more uniform single-cross x back-cross hybrids would be practical since vigorous single crosses would constitute the seed parents.

1325 *Kneebone, W. R. Selection for seedling vigor in native grasses under artificial moisture stress.* (*p. 55*).

Sound caryopses of switchgrass (*Panicum virgatum*), sand bluestem (*Andropogon hallii*) and sideoats grama (*Bouteloua curtipendula*) were placed on thick bacteriological filter discs floating on solutions of d-mannitol in covered glass dishes in the greenhouse. Growth was obtained with osmotic pressures up to 15 atm. but for screening purposes a tension of 7·5 atm. is regarded as adequate. Significant differences among varieties, strains and open-pollinated progenies of selected plants were found in rates of germination and growth during the 10-day period after initiation of testing. Within varieties of the last two species, large caryopses produced faster-growing seedlings than small. Varieties of known superiority in ease of establishment, such as the switchgrass Caddo and sideoats grama Coronado, were superior in rate of germination and seedling growth.

1326 *Knowles, R. P. Comparison of crested wheatgrass synthetic strains in the Syn 1, Syn 2, and Syn 3 generations.* (*pp. 55–56*).

Synthetics of Fairway (diploid) and Standard (tetraploid) were tested in the above generations; they were developed from a small number of plants superior in combining ability at a 2 ft. row spacing. When grown at a 1 ft. row spacing, the synthetics showed only minor improvements in forage yield over the control varieties but as spaced plants exhibited considerable superiority, particularly in the Syn. 1. With 1 ft. spacing, the Syn. 1 and Syn. 2 were comparable in yield. When grown as spaced plants, reductions in yield from the Syn. 1 to Syn. 2 in Fairway and Standard were respectively 5% and 20%. The seed yield of Fairway declined 11% from the Syn. 1 to Syn. 2. Evidence of incompatibility was obtained from isolated plots in which the average percentage seed set was reduced from 70 in the Syn. 1 to 47 in the Syn. 2 and to 42 in the Syn. 3. Compared with outcrosses, controlled crosses of half-sib plants showed 50% reduction in seed set.

1327 *Konzak, C. F., Caldecott, R. S., Curtis, H. J. & Delihas, N. The influence of ion density and environmental factors on the radiosensitivity of seeds. II. The relation of pre- and post-irradiation storage conditions and temperature to observed radiation damage. (p. 56).*

The following results suggest some new approaches in mutation research. "Damage observed in seedlings from X- or gamma-irradiated dormant barley seeds increases with storage time prior to planting. At least two components of this after-irradiation effect can be identified: a 'fast' component which has an approximately 4 to 6 hour half life, and a 'slow' component which has an apparently indefinite life. With neutron-irradiations, the after-treatment effects are absent or very small. The water content of the seed is very important in determining the magnitude of the delayed effect. Very dry seeds have a very large first component to the curve, whereas moist seeds have almost no rapid component. Both dry and moist seeds have a comparable 'slow' component. When seeds are irradiated very rapidly and immediately placed in water to initiate germination, there is virtually no difference in radiosensitivity between dry and moist seeds, so previously reported differences were manifestations of the storage phenomenon. A one-hour dry heat pre-treatment reduces the injury observed in seedlings from X-irradiated dry dormant seeds, but as a post-treatment heat has the opposite effect. On the other hand, storage of irradiated seeds in dry ice (— 80° C.) greatly retards the 'delayed' effects. After-irradiation effects seem to be the principal cause of variability in the response of seeds to radiation."

1328 *Miller, P. A., Williams, J. C., Robinson, H. F. & Comstock, R. E. Estimates of genetic and environmental variances and covariances in upland cotton and their implications in selection. (p. 56).*

"Three populations of F_4 and F_5 lines of Upland cotton were grown under several environments, and estimates were obtained of the genetic, environmental, and genotypic x environmental interaction variances and covariances for 10 economic traits.

"Relative to the magnitude of the genetic components, environmental variances as measured by the plot error were generally large for lint yield, bolls per plant, seed per boll, and boll weight, and small for lint percentage, seed and lint index, and fiber length, strength and fineness. The genotype x environment interaction variances were rather large for lint yield and bolls per plant but generally small for the other characteristics. Sufficient genetic variability appeared to be present in all populations to provide for rather substantial genetic advance through selection for each of the traits studied. In all populations lint yield was highly positively correlated with lint percentage and bolls per plants and negatively correlated with seed index and weight per boll. Utilizing the variance and covariance relationships of these related traits, various selection indices for lint yield were constructed and evaluated. Several of these indices appear promising as a means of increasing the efficiency of selection for yield."

1329 *Moore, E. L., Drolsom, P. N. & Keller, K. R. Variation for selection criteria within and among flue-cured tobacco breeding lines. (p. 56).*

With a view to reducing the cost and time involved in conducting replicated field trials at several centres, an estimation was made of the relative magnitude of the variation within and among breeding lines with respect to several criteria of selection, according to locations, entries, families, selections within families, and their various interactions. It was concluded that more efficient progress for a given number of locations, replications and entries within a location may be obtained by increasing the number of families rather than the number of entries within families.

1330 *Murphy, H. C. & Petr, F. C. Straw strength studies in oats. (p. 56).*

Entries in a world collection were evaluated at Aberdeen, Idaho, for straw strength by means of (1) the tension or "snap" test, (2) "chain measurement (Clr)" and (3) determination of the percentage of natural lodging. The following were chosen as outstandingly stiff-strawed types for use in recurrent selection to improve straw strength: AA708 (CI5155), Craigs Afterlea (CI7026), Scotland (PI193027), Beacon x Laurel (Ottawa 3932–16), Milford S–225 (PI193101), Appler x Clinton-Santa Fe (CI5545) and Clinton (CI4969). Correlation coefficients between (*a*) snap-test values and lodging percentages (+ 0·79), (*b*) Clr readings and lodging percentages (— 0·50) and (*c*) snap-test values and Clr readings (— 0·84) were highly significant. No information is provided on the techniques of (1) and (2).

1331 *Norden, A. J. & Frey, K. J. Heritability estimates, time of development, and association of characters with lodging resistance in oats.* (*p. 57*).

Data were obtained on the lodging resistance of the parent and F_2 of four crosses by means of the Clr method [cf. 1330]. Heritabilities in the "broad sense" ranged from 1 to 78%. Development of straw strength was determined by means of Clr readings taken at intervals of 2 or 3 days during the period from anthesis to maturity. Straw strength declined until about 17 days after anthesis and then increased quite rapidly until maturity. Clr readings were correlated in a highly significant manner with (1) culm height (— 0·34), (2) culm diameter at the basal internode (+ 0·53), (3) thickness of culm wall (+ 0·41), (4) amount of stem tissue in the cross section of the basal internode (+ 0·56) and (5) yield of grain per panicle (+ 0·45).

1332 *Nuffer, M. G. Additional evidence on the nature of artificially induced mutations in maize.* (*p. 57*).

Making use of the closely-linked markers α β Sh_2 (total map distance, 0·25), the possibility of whether treatment with X rays or ultraviolet rays could change the middle gene without affecting its neighbours was investigated. Recessive ears were fertilized by treated and control dominant pollen. Frequencies of whole-seed changes of β without alteration of α and Sh_2 were: control, 0 per 9228 plants; ultraviolet, 12/8888; and X rays, 0/8739. Frequencies of partial changes in the seed were: control 0/9228; ultraviolet, 11/8888; and X rays, 0/8739. A similar experiment was carried out on a stock with two markers, one being a single-component A_1 allele whose mutability is affected by Dt; the stock was however free from this component. The results of the second experiment provided further evidence that, unlike ultraviolet treatment, X rays did not induce genic changes.

1333 *Osborne, T. S. Some factors in radiation response of concern to plant breeders.* (*p. 57*).

Reference is made to a mathematical model which permits extrapolation, with a fair degree of accuracy, from early seedling behaviour, to expected field behaviour, subsequent to seed irradiation. By means of this technique and data on actual survival, it has been possible to divide certain crops into "sensitivity groups based on the dose-range expected to yield about LD_{50} from seed irradiation". A list is given of these sensitivity groups in the case of Co^{60} γ rays (1·1 and 1·3 Mev; intensity *ca.* 800 r./min.) and fission neutrons (flux 1·4 x 10^{12} thermal N/cm.^{2}/hr. and 7·9 x 10^{10} fast N/cm.^{2}/hr.).

1334 *Osler, R. D. & Wellhausen, E. J. Utilization of wide crosses in the Mexican corn program of the Rockefeller Foundation.* (*p. 57*).

According to preliminary data, certain crosses between races of maize differing widely in area of adaptation as well as in agronomic characters are superior in yield to currently recommended hybrids. Races Tuxpeño, Zapalota Grande, Tabloncillo, Vandeño and Jala proved to be particularly promising parents in various regions in Mexico.

1335 *Owen, C. R. Effects of radiation of Dallisgrass seed with thermal neutrons on subsequent generations.* (*p. 58*).

The results of exposing seed of *Paspalum dilatatum* to thermal neutrons for 0·5–6 hr. suggested that duration of treatment should not exceed 3 hr. Albino seedlings were found in 7% of the progenies of N_1 plants.

1336 *Petersen, R. G., Weswig, P. H. & Cowan, J. R. Palatability differences in tall fescue as measured by grazing sheep.* (*p. 58*).

Consistent genotypical differences in palatability were measured by the following technique in breeding at the Oregon Agricultural Experiment Station. A dozen sheep were grazed on the experimental plots for a period of 2 days and the number of sheep feeding on each plot was recorded at 5-minute intervals from 7·00 to 10·00 hr. Relative palatability was then expressed as the total number of times the plot was grazed during the period of observation.

1337 *Porter, K. B. & Atkins, I. M. Inheritance of shattering in wheat.* (*p. 58*).

Inheritance of the above character was studied in the three possible crosses among Cimarron, Blackhull and Wichita, a relative estimation of tendency to shatter in individual plants being obtained in the laboratory by means of a brushing device. A correlation of 0·66 between field and laboratory ratings was obtained for 138 F_4 lines of Cimarron x Wichita. The shattering resistance of Cimarron and Blackhull was dominant to the susceptibility of Wichita. Apparently Cimarron differed from Wichita by at least four pairs of genes whereas Blackhull differed from the susceptible variety by two pairs. Cimarron and Blackhull differed only slightly in resistance and the F_2 of their cross did not segregate distinctly for this character; significant differences were however obtained between the means of the F_3 lines. Estimates of heritability were extremely low, when based on the regression of F_3 means on F_2 parental measurements. Estimates of heritability based on variances of the means of F_3 lines ranged from 0·35 to 0·69.

1338 *Raab, Q. J., Atkins, I. M. & Futrell, M. C. A study of methods of inoculating oats to determine their reaction to* Helminthosporium victoriae *and a comparison of Texas field collections of the organism. (p. 58).*

The "rag-doll", greenhouse spray and field methods were compared. The second technique was found to be reliable and rapid [cf. XXVII, 1673].

1339 *Rawlings, J. O., Hanway, D. G. & Gardner, C. O. Variation in quantitative characters of soybeans in the second generation after irradiation of seeds with X-rays and thermal neutrons. (p. 59).*

An estimation was made of the effect of thermal-neutron and X-ray treatments on the total genetic variance of plant height, maturity, yield and seed weight in Hawkeye and Adams at Lincoln, Neb. Progenies of 100 N_2, 100 X_2 and 100 control plants from each variety were grown in an incomplete block design in two replications, the component of variance for "among progenies within blocks" being used as an estimate of the total genetic variance. Except for yield in the control populations, the genetic variances calculated were significant, estimates of the variance in the irradiated populations being on the average five times greater than those in the controls. The genetic change expected from selection of the upper or lower 10% of each population was determined for each character. Predicted genetic changes and predicted means for the selected populations in the next generation indicated that changes in maturity and seed size may be brought about by irradiation but possibly not in yield and height.

1340 *Rhyne, C. L. Block inheritance of genes in cotton. (p. 59).*

The block inheritance of genes, possibly resulting from the localization of chiasma or a low frequency of random chiasma formation, causes difficulties in the transference of characters in cotton. Blocks of genes transferred from related species to Upland cotton exhibit reduced recombination as compared with their alleles within the cultivated species, e.g. "the D_5 linkage $C11$–5–$R1^{\mathrm{rai}}$–6–Y_g1–20–Dw shows 11% recombination at the first two regions while the domestic D_h linkage $C1$–14–18$r1$–14–20–$Y_{\mathrm{g}}1$? *dw* shows 28–38% recombination in a similar background". It is pointed out that block inheritance may bias estimates of additive genetic variance.

1341 *Rivers, G. W. Inheritance of resistance to* Helminthosporium *blight, crown rust race 216 and stem rust race 7A. (p. 59).*

Data from crosses involving four diverse strains of oats suggested that resistance to *Helminthosporium victoriae* and race 216 of *Puccinia coronata* var. *avenae* were controlled by single major recessive genes. In the cross Garry x Bronco, the resistance of the former parent to race 7A of *P. graminis* var. *avenae* was inherited as a dominant and monofactorial character.

1342 *Rubis, D. D. Cumulative backcrossing as a breeding method for transferring earliness between two safflower lines. (p. 59).*

The Indian introduction A1186 is low in yielding ability and oil content but matures about 10 days earlier than the commercial variety Nebraska 10. An attempt to combine this earliness with the high yield and oil content of Neb. 10 by direct crossing and selection has been unsuccessful at the Arizona Agricultural Experimental Station. The standard method of back crossing and selfing is being compared with cumulative back crossing. In one cycle of the latter method, selected segregates are back-crossed to the recurrent parent and in the following generation the progenies are intercrossed in all combinations to produce seed for the next segregating population. In initiating the first cycle, the 10 earliest plants in the F_2, none of which were as early as A1186, were back-crossed to Neb. 10; the earliest plants in the first intercrossed population were as early as A1186 and earlier than plants obtained by other methods.

1343 *Russell, W. A. & Hooker, A. L. Studies on the inheritance of resistance to corn leaf rust,* Puccinia sorghi *Schw. (p. 60).*

Seedling tests have indicated that 68 of 300 maize strains from 10 countries possess protoplasmic resistance to one or more of 59 isolates of *P. sorghi*. Resistance was dominant in 44 strains and recessive in 10. A single-factor ratio for segregation of rust reaction was obtained in 23 strains and a duplicate-factor ratio in 2. Inbreds K148, B38 and GG208R were resistant to the majority of isolates; the Peruvian strain Cuzco was resistant to all. F_2 and back-cross data indicated that the reactions of the four strains to 11 isolates are due to single dominant genes which, together with two or possibly three genes from other sources, constitute an allelic series.

1344 *Schertz, K. F. & Murphy, R. P. Fertility in relation to chromosome behavior in* Bromus inermis. (*p. 60*).

The percentage of fertile florets ranged from 1·2 to 75·4% among 60 clones, the mean being 46·8%. Significant differences were found between and within open-pollinated progenies with respect to percentage of fertile florets. The numbers of regular chromosomes were respectively 54, 55, 56, 57 and 58 in 3, 8, 12, 1 and 1 of the 25 clones analysed. Seven clones had fragments. Euploids were more regular at meiosis and slightly higher in fertility than aneuploids. Clones without fragments were more regular meiotically and somewhat more fertile than clones with them. The number of lagging univalents at anaphase I, percentage of anaphase-I cells with laggards and percentage of quartets with micronuclei were each negatively and significantly correlated with percentage of fertile florets. Cytological data from root-tip sections and smears and from sporocyte smears were confirmatory.

1345 *Singleton, W. R. & Caspar, A. The cobalt-60 machine as a plant breeding tool.* (*p. 60*).

Investigations on maize at the University of Virginia have shown that most of the mutations induced late in the meiotic cycle by γ radiation from the above type of apparatus are chromosomal. Some recessive endosperm mutations have been induced at the premeiotic stage, including mutations from *Sh* to *sh*, *Wx* to *wx* and *Su* to *su*. It has not yet been determined whether small deficiencies are associated with these mutant changes. It is suggested that premeiotic treatment has an advantage in that deleterious alterations are screened out during meiosis.

1346 *Smith, F. H., Rhyne, C. L. & Miller, P. A. Breeding for low gossypol content in cotton.* (*p. 60*).

Selection of segregating populations for low number of glands in the leaves adjacent to the flowers has resulted in reduction in gossypol content.

1347 *Troyer, A. F. & Jugenheimer, R. W. Effect of Diplodia stalk rot on some agronomic characters of corn inbreds and hybrids.* (*p. 61*).

Using 196 inbreds and 54 hybrids of maize, the effects of inoculations with *D. zeae* upon stalk strength, stalk lodging and grain yield were determined. A portable device which compensated for ear height was used to measure stalk strength in the field. The effect on yield was small in comparison with the effects on the other two characters. It is suggested that determination of stalk strength may be substituted for the usual practice of splitting stalks in evaluating for resistance to this disease; the latter practice is only necessary for the distinction of resistance from tolerance.

1348 *Wallace, A. T., Chapman, W. H. & Luke, H. H. Hybrid vigor for forage production in varietal crosses of rye.* (*p. 61*).

F_1 hybrids from 28 crosses among 9 varieties, together with their parents, were grown in single-row plots 10 ft. long and replicated 8 times at the Florida Agricultural Experiment Station. On the basis of all the monthly cuts made from December to March, the hybrids produced on the average 15·2% more forage than the parents. The average production of the hybrids ranged from 95 to 132·5% of the parental yields, hybrids involving Florida Black being the most productive. Certain specific combinations showed a range of 72·5–170·4% of the yields of the parents, the most productive being Wren's Abruzzi x Wood's Abruzzi and Wren's Abruzzi x Gator. The average production of the hybrids for different dates of cutting exceeded that of the parents except in the case of the cut in March. Low yield from the last cut was general, except for two combinations, and was indicative of partial dominance of earliness.

1349 *Wells, D. G. Seed set in wheat and barley after scissor and tweezer emasculation, and after pinching of anthers.* (*p. 61*).

Mass pollinations were effected on heads emasculated in the following ways. On each of 11 male-fertile heads of barley, half of the florets were trimmed with scissors just below the anther tips and the other half above the anthers, which were then removed. Seed sets were respectively 77 and 78%. On each of six male-sterile ears, half of the florets were clipped across the tips of the stigmas, the other half well above the stigmas. Seed sets were respectively 84 and 92%. In the case of another six male-sterile heads, half the florets on a head were clipped across the stigma bases, the other half well above the stigmas. Seed sets were respectively 64 and 87%.

On 21 ears of wheat, comparisons were made between the results of clipping florets above and just below the anther tips, prior to removal of the anthers. Seed sets of 84 and 93% were obtained respectively. Some ovaries survived in secondary florets after scissor emasculation; these were not included in floret counts but were included in seed counts, the higher seed set obtained with scissor emasculation thus being accounted for. Injuring anthers by pinching them with tweezers in unclipped wheat florets was tested as a procedure of emasculation; only 8 seeds were secured by selfing 103 florets. [cf. XXVI, 1550].

1350 *Clayton, E. E. The genetics and breeding progress in tobacco during the last 50 years.* (*p. 62*).

The role of intraspecific and interspecific hybridization in breeding disease-resistant tobacco in the USA is outlined.

1351 *Ware, J. O. Progress in cotton breeding during the last fifty years.* (*p. 62*).

The way in which various problems of cotton production in the USA have been solved by breeding is briefly indicated.

1352 *Brandon, J. F. Some experiences with plant breeding and crop variety reaction in the high altitude portion of the Central Great Plains Region.* (*p. 63*).

So far the special problems of breeding crops for the above region in the USA have been tackled chiefly by introduction of varieties from climatically similar regions in Russia and other countries and by selection of heterogeneous, or mechanically mixed, varieties. The oat Bunker and the sorghum Coes are outstanding examples of the latter method. So far little hybridization has been carried out in the region.

1353 *Newman, J. E., Mulvey, R. R., Crane, P. L. & Miles, S. R. Some major environmental factors to consider in varietal testing.* (*p. 65*).

Factors which have received special attention in variety testing in Indiana include latitude, soil texture and date of planting.

1354 *Pergament, E. & Davis, R. L. Morphological and physiological differentiation of red clover varieties.* (*p. 65*).

Dollard, Pennscott and Kenland were distinguished by differences in time of flowering, total number of flowering stems, proportion of nonflowering to flowering plants, height of the flowering stem, and height and number of petioles. Observations during the seedling year offered the best basis of differentiation.

1355 *Peterson, M. L. & Cooper, J. P. Control of heading responses in* Lolium. (*p. 65*).

"Floral induction in *Lolium* is accelerated by the exposure of imbibed seeds to low temperature (0 to 5° C.) or of young seedlings to short days. Species and strains show a wide range in response to low-temperature or short-day induction. There is similar variation in the length of photoperiod required for floral initiation once induction is complete. Both low temperature response and requirement for long photoperiod are polygenically controlled, and both behave as threshold characters.

"In the present study, imbibed seeds of *L. perenne* were given a range of cold treatments, with and without low intensity lighting. The percentage of plants headed was more than doubled when an 8-hour photoperiod was supplied concurrently with the low temperature. When seedlings at the 1st and 3rd leaf stage were exposed to low temperature, the proportion of plants headed and rapidity of heading were much greater than with the imbibed seeds. Inbred lines of *L. temulentum*, which show a quantitative low temperature response, were used to investigate the effectiveness of cold treatment at different stages of seedling development, and also the influence of photoperiod before, during and after low-temperature induction. The use of genetic control of heading as a means of developing permanently vegetative grasses is considered."

1356 *Clark, K. W. The* in vitro *digestion of dry matter in several varieties of timothy.* (*p. 69*).

Clonal selections of varieties were evaluated at the Indiana Agricultural Experiment Station for dry-matter digestibility by means of an artificial rumen technique, the forage being prepared for digestion by quick freezing the freshly-cut herbage in the field and by subsequent lyophilization. The plants were harvested at 10-day intervals throughout the first growth cycle. At the first stage of cutting (14 April) the varieties showed significant differences, attributable to the high fructose content of several varieties. Differences were small both between varieties and cutting dates for the remainder of the leafing stage. At the onset of the boot stage a marked decrease in digestibility was detected. As maturity approached intervarietal differences increased. From the beginning of growth until seed formation the digestibility estimates declined from an overall average of 74% to 40%.

1357 *Keim, W. F. Seed set failure in zigzag clover,* Trifolium medium. *(p. 74).*

Genotype was found to be one of the factors affecting seed set.

1358 *McMurtrey, J. E. (Jun.) & Wilson, D. B. Natural crossing of tobacco in Maryland. (p. 75).*

A considerable amount of natural cross pollination was detected.

1359 *Duich, J. M. & Musser, H. B. The extent of aberrants produced by Merion Kentucky bluegrass,* Poa pratensis *L., as determined by first and second generation progeny tests. (p. 76).*

The above grass proved to be highly apomictic. Some first-generation aberrants reverted to apomixis in the next generation. Variability was greater in plants from polyembryonic seed than in those from seeds with a single embryo.

1360 *Schery, R. W. Regional adaptation in Kentucky bluegrass. (p. 78).*

Attention is drawn to the extremely wide range of phenotypic adaptation of *Poa pratensis* in North America; this species evidently has considerable genotypic flexibility.

1361 *White, R. W. (Jun.) & Nutter, G. C. Yield versus qualitative evaluations for inter and intra variety comparisons in turf research. (p. 78).*

Yield and turf quality were significantly correlated within varieties of *Cynodon dactylon* but not in intervarietal comparisons.

1362 *Burton, G. W. The military potential of improved strains of Bermudagrass. (p. 83).*

Strains released during the last decade in the USA are discussed with reference to their value for air strips and other sites in military establishments.

1363 HAYES, H. K.
A half-century of crop breeding research.
Agron. J. 1957 : **49** : 626–31.

Speaking upon the occasion of the fiftieth anniversary meeting of the American Society of Agronomy and drawing upon his personal experience, the author discussed the contributions made by the following to crop improvement in the USA: the extension of Mendelian laws, genetics and cytogenetics, the concept of centres of origin, exploitation of heterosis, development of varieties resistant to diseases and pests, applications of statistics, special techniques such as back crossing and maize-breeding methods, and cooperation.

1364 **Director's Annual Report of the Colombian Agricultural Program, May 1, 1956-April 30, 1957** : Rockefeller Found., NY : Pp. 190. (Mimeographed).

Wheat. The agronomic and rust resistance characteristics and the milling and baking qualities of some promising new hybrids are reported. Some early varieties were found to escape frost damage to pollen and gave higher yields than Bonza in the frost zone. Frocor, Frontana x Thatcher and 150 have shown resistance to dwarfing.

Maize. The collection and classification of maize varieties in Colombia has been completed. Many new hybrids are being tested and synthetics of various types are being produced. A programme of intervarietal crossing was started to find the best varieties for producing hybrid vigour; some varieties were selected for the production of an early flour-maize with the ear length of late-maturing flint types. Breeding for increased yield and resistance to ear rots in white lines was continued. Back crosses of (yellow varieties x Venezuela Puya Grande) x Venezuela Puya Grande were made to increase ear length and grain size in the yellow types; Peru 330 may be used instead of Venezuela Puya Grande. Some lines of Eto and Cuba 2 are being used as a source of resistance to army worms; Amarillo Theobromina 13B [Theobromina Yellow 13B] and Eto 13 were found resistant to *Diatraea* spp. Some selections from Desconocido 2–229 [Unknown 2–229] and some yellow lines showed resistance to *Fusarium* and *Diplodia*. Breeding for resistance to *Heliothis zeae* and *Empoasca* is in progress. The results of yield trials held at four centres are reported.

Barley. The early variety Bachue, which is now undergoing commercial increase, is described; it is resistant to lodging. Tabular data are provided on the yielding ability and disease resistance of some promising varieties. Crosses made with Nariño 7 have shown resistance to dwarfing; of these DCN 7 x Surprise–FR1391 has the highest yielding ability. Funza, Bachue and Tequendama (PI6978 x Funza) are being used in breeding for improved disease resistance and quality.

Forage crops. Varietal trials of red and white clover, lucerne, annual and perennial ryegrass, and sorghum were held. Attempts are being made to produce ryegrass lines which perennate, are rust tolerant and give high yields of seed and forage.

Potato. Selection for field resistance to *Phytophthora infestans*, high specific gravity, good keeping quality, early maturity and other desirable agronomic characters was continued with *Solanum tuberosum* x *S. tuberosum* ssp. *andigenum* crosses.

Bean. At Palmira, the line 223–3–3–1–M–M gave high yields during drought periods and epidemics of *Isariopsis griseola* and *Cercospora canescens*. The results are reported of yield trials with the best new lines; at Medellín, lines are being produced which combine resistance to most of the destructive diseases. Some selections at Bogotá have shown adequate resistance to *Colletotrichum lindemuthianum*; Sánchez showed good resistance but has an undesirable growth habit. The principal characteristics of the best varieties, which are to be used in future breeding, are described. The lines 133–1–15–1A–M–M and 138–2–4–12–2–M–M were named Maravilla [Marvel] and Encanto [Charm] respectively; both combine high yielding ability with resistance to drought and *I. griseola* and tolerance of *Empoasca*, but they have undesirable pod and branching characters.

Cowpea. Yield trials were held at Montená; the highest yielding varieties were Bolívar 17, which is used for human consumption, and Venezuela 5, a green manure crop used in rotation with cotton.

1365 Estación Agrícola Experimental de Palmira. Memoria 1953. **(Palmira Experimental Station. Report for 1953)** : Pp. 170.

Maize. Mass selection has been carried out in local Colombian varieties and two synthetic varieties have been produced. One of these, Palmira V–1, is a product of crossing a second-generation inbred of Costa Rica Yellow Dent with a mass selection of Cuban Yellow Flint; it is suitable for growing at altitudes between 600 and 1000 m. and matures in 120 days. It produces two ears per plant and has small, yellow, semident grains.

Palmira V–2 arose from a cross of Amarillo Común [Common Yellow] x Cuban Yellow Dent and is suitable for altitudes of 600–1200 m., where it matures in 145 days and has yielded 10–12% more than the local varieties; it has yellow flint grains of medium size.

Sugar cane. From crosses of *Saccharum spontaneum* 'Amu Darya' from Turkestan, followed by several generations of nobilization, some promising mosaic-resistant seedlings suitable for Colombia have been produced, and data are given on their yields of sugar; some have yielded up to 60% more than POJ2878.

Crosses have been made with some other varieties of *S. spontaneum* and with *S. robustum* and *S. sinense*. A report is given of the behaviour of a number of canes introduced into Colombia from other countries.

Cacao. Studies of incompatibility have been continued [cf. XXIII, 2888].

Vegetables. Only a 2% set was obtained in 536 crosses of French beans. Observations have been made on 111 hybrid lines.

1366 GIRARD, F. & BARRAU, J.
Quelques plantes alimentaires et rituelles en usage chez les Buang, District de Morobé, Nouvelle Guinée sous tutelle Australienne. **(Some food and ritual plants used by the Buangs, Morobe District, New Guinea, Australian protectorate).**
J. Agric. trop. bot. appl. 1957 : 4 : 212–27.

Local varieties of the following crops are mentioned: *Setaria palmifolia, Ipomoea batatas, Saccharum officinarum, Dioscorea alata* and banana. Brief descriptions are given of the *D. alata* varieties.

1367 **Thirty-first Annual Report of the Department of Scientific and Industrial Research, New Zealand 1957** : Pp. 84.

The section of this report entitled Research includes the following items of interest to plant breeders:—

Wheat. A new general-purpose wheat, named Aotea, has been bred at the Crop Research Division from the cross (Hofed x Cross 7) x (Dreadnought x Cross 7). It combines high yields with good baking quality and desirable agronomic characters, namely short straw, lodging and shattering resistance, ease of threshing and resistance to leaf diseases.

Tobacco. Coker 130 has been found to possess some resistance to *Verticillium* wilt.

1368 DELONE, L. N.
(The method of radiation breeding).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 23–27. [Russian].

The attention of readers is called to the early work on the induction of mutations carried out in the USSR by the author and others [cf. I, 507 and IX, 257–8] and to more recent results obtained in Sweden, Germany and the USA [cf. 193–4]. While pointing out the difficulties of the method, the author recommends its application in breeding work to supplement, though in no way to replace, the methods of hybridization and selection.

An editorial note points out that the method is a means of shattering the hereditary constitution of the plant.

1369 NELSON, O. E.
The feasibility of investigating "genetic fine structure" in higher plants.
Amer. Nat. 1957 : **91** : No. 860 : 331–32.

The possibility of investigating the genetics of the gametophytic rather than the sporophytic generation in flowering plants is discussed and illustrated by reference to studies of mutations at the waxy locus in maize by means of which changes and recombination involving different mutational sites within the locus may be detected.

Abstracts of papers presented at the 1957 meetings of the Genetics Society of America held in Stanford, California, August 26 to 28, 1957.
Genetics 1957 : **42** : 357–404.

1370 *Bianchi, A. Gametophyte factors in maize-teosinte derivatives.* (*pp. 360–61*).

Two *Ga* factors have been identified on chromosome 9. One is either identical with, or an allele of, Ga_8, and is closely linked with *wx*, while the other is either a weak allele of Ga_8 or a *Ga* factor loosely linked with *wx*. [Cf. XXVII, **1721**].

1371 *Brewbaker, J. L. Pollen anatomy and self-incompatibility in plants.* (*pp. 361–62*).

Two self-incompatibility systems are suggested, differing in the time of action of *S* alleles in microsporogenesis. In the first case, the gametophytic system, pollen phenotype is determined autonomously by the *S* allele in the pollen, which is binucleate, sperm formation following germination, while in the second, the sporophytic system, pollen behaviour is dictated sporophytically by the maternal S genotype and the pollen is trinucleate, sperm formation preceding germination. In the first group incompatibility is expressed as pollen-tube inhibition and in the second as inhibition of pollen germination. A correlation between pollen anatomy and incompatibility system has been found in some families.

1372 *Brink, R. A. The absence of a cytoplasmic factor in the genetic change in R expression in maize plants heterozygous for stippled.* (*p. 362*).

"R (self-colored aleurone) in maize regularly changes to R', a weakly pigmenting form, in $R\ R^{st}$ heterozygotes. The R' form is maintained in heterozygotes with r (colorless aleurone) but reverts partially (not completely as implied in *Genetics 41*: 871–889) toward the standard R level of pigmentation in $R'R'$ homozygotes derived from $R\ R^{st}$ by selfing. Matings of the type rr ♀ x standard RR ♂, in which the rr parent was derived from $R^{st}r$ by selfing, give the same darkly pigmented aleurone phenotype as results from standard rr ♀ x standard RR ♂ crosses. Also, normal R action is not altered in Rr sporophytes carrying an r allele derived from $R^{st}r$ plants. This evidence points to two conclusions (1) the genetic change from R to R' is not attributable to a cytoplasmic factor and (2) the capacity of R^{st} to induce the change from R to R' in $R\ R^{st}$ plants is not conferred upon r in $R^{st}r$ heterozygotes." [Cf. XXVII, 1739 and 4004].

1373 *Brown, M. S. The division of univalents in* Gossypium. (*p. 362*).

Univalent chromosomes which rarely divide at the first meiotic division are frequently found in species hybrids and asynaptic lines of species and hybrids of *Gossypium*. They are distributed at random to the poles at anaphase I and divide regularly at the second division. It is thought that aberrant division of univalents gives rise to centric fragments which pair to form heteromorphic bivalents at metaphase I, thus providing a mechanism for restoring the $2n$ centromere number and also for minor changes in the chromosome complement by crossing over with the normal homologue or by providing a point of attachment for other fragments.

1374 *Case, M. E. & Giles, N. H. Evidence from tetrad analysis for both normal crossing over and "gene conversion" at the pan-2 locus in* Neurospora crassa. (*p. 364*).

The results are presented of tetrad analysis of a cross of two pantothenic acid mutants, B_3 and B_5, and it is concluded "that the *pan*-2 'locus' can be separated into two units on the basis of genetic (crossover) as well as functional (heterocaryon) tests. The three types of atypical asci—with one wild type but no double B_3–B_5 or with a 3 : 1 ratio of mutant types—are interpreted as having arisen as a result of 'gene conversion' affecting either one or the other or both parts of the *pan*-2 'locus'."

1375 *Caspar, A. & Singleton, W. R. Induced "gene" mutation in maize.* (*pp. 364–65*).

Maize plants at different stages of microsporogenesis were exposed to γ radiation at the

Brookhaven National Laboratory, NY, and a number of mutants were recovered in the progeny of crosses using pollen from the irradiated plants. It is concluded that "by selecting the proper stage of maize microspore development it is possible to induce changes which are inherited as simple recessive genes."

1376 *Cohn, N. S. The effect of carbon monoxide on the restitution of X-ray-induced chromosome breaks in* Allium cepa. (*p. 366*).

It has been found that carbon monoxide prevents the restitution of both rapidly and slowly rejoining chromosome breaks [cf. XXVII, 1159] as long as it is present in the cells and that its effect is light-reversible. This is taken to provide evidence against the existence of ionic linkages in chromosomes since it was expected that carbon monoxide should affect the formation of covalent bonds only.

1377 *Cuany, R. L., Sparrow, A. H. & Pond, V. Genetic response to** Antirrhinum majus *to acute and chronic plant irradiation.* (*p. 366*).

Irradiation with γ rays and X rays has resulted in the appearance of flowers showing pink or white flecks and sectors which are interpreted as somatic mutations induced at different times during flower development. The appearance of larger mutant sectors several months after exposure is taken to indicate the induction of persistent genetic changes.

1378 *de Serres, F. J. A genetic analysis of an insertional translocation involving the ad-3 region in* Neurospora crassa. (*pp. 366–67*).

Evidence suggesting that a chromosome segment carrying the *ad–3B* and *nic–2* loci had been moved from the right arm of LGI to some other position in the genome of a strain of the *ad–3B* mutant B12 is presented and discussed.

1379 *Englesberg, E. Mutation to diauxie resistance.* (*p. 368*).

Mutants, designated c^-, which are able to use various Krebs cycle compounds as sources of energy, have been isolated from *Salmonella typhimurium* 'LT2'. They cannot use glucose or other carbohydrates and the addition of glucose to a medium containing citrate inhibits growth. Selection occurs under these conditions for "glucose resistant" mutants, designated C^-dg^r. The characteristics of the wild type, C^+dg^s, and of the mutants c^-dg^s, C^-dg^r and C^+dg^r are described and discussed.

1380 *Fabergé, A. C. Relation between chromatid-type breakage-fusion-bridge cycles in maize endosperm.* (*pp. 368–69*).

Evidence is presented, from the cross *I Sh Bz Wx Ds* x *Ds C Sh Bz Wx Ac/ac*, that in maize endosperm two chromatid breakage-fusion-breakage cycles do not coalesce to form a single chromosome breakage-fusion-breakage cycle.

1381 *Haas, F. L. & Doudney, C. O. A relation of ribonucleic acid synthesis to radiation induced mutation frequency in bacteria.* (*pp. 374–75*).

Both the frequency of mutation per unit dose and the level attained after exposure to ultraviolet light have been found to be considerably increased for some mutants of *Escherichia coli* by incubation before irradiation on media supplemented by yeast extract, purines and pyrimidines from ribonucleic acid, riboflavin or p-aminobenzoic acid. Evidence that these increases are related to RNA synthesis is discussed.

1382 *Hovin, A. W. Seasonal variation of meiotic chromosome pairing in haploid* Poa annua *L.* (*pp. 377–78*).

A significantly higher mean frequency of bivalents was found in pollen mother cells of two lines of *P. annua*, in which $2n = 14$, in warm weather than in cool weather. A mean increase of one bivalent for an increase of about 10° C. in the mean minimum night temperature was observed within the range 7° to 16° C.

1383 *Iino, T. & Lederberg, J. An analysis of monophasic variants of* Salmonella. (*p. 378*).

Transduction studies with *Salmonella* spp. [cf. XXVII, 1041] have shown that one group of monophasic variants results from three mutations designated Ah_1^- which block the synthesis of H_1 protein.

1384 *James, A. P. The process of nongenic mutation in an unstable strain of yeast.* (*p. 379*).

"The spontaneous production of respiratory-deficient mutants of nongenic origin was investigated in an unstable strain of *Saccharomyces cerevisiae*. Experimental methods included timed measurements of the size of microcolonies to permit a determination of the relative degree of instability of individual cells. The mutation was found to be lethal but death can be averted by a subsequent gene mutation. Stability of the strain is correlated with rate of division of cells.

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* *sic.*

Evidence is presented that the appearance of a mutant is the result of a sequence of chance events rather than of the breakdown of a system involving the orderly assortment of cytoplasmic factors."

1385 *Janick, J., Mahoney, D. L. & Stevenson, E. C. Cytological analysis of diploid x triploid crosses in spinach. (p. 379).*

The following segregation was found in 588 plants from diploid pistillate x triploid staminate: 51% were diploid with 12 chromosomes, 19% were trisomic with 13 chromosomes, 1% had 16 chromosomes, 12% had 17 and 15% were triploid with 18 chromosomes. None was found to have 15 chromosomes although such plants did occur among the progeny of the reciprocal cross. The trisomics fell into six morphological groups thought to represent the six possible trisomics. Segregation of sex in such crosses depends on the constitution of the staminate parent, that is whether it is XYY or XXY.

1386 *Kamra, O. P. Effects of polyploidy on cotton fibers. (p. 380).*

A significant increase in fibre perimeter was found in tetraploid *Gossypium herbaceum*, *G. arboreum* and *G. herbaceum* x *G. arboreum*, in octoploid *G. barbadense* and in one specimen of octoploid *G. hirsutum*, as compared with diploids. "For any particular genotypes and their derived polyploids the data revealed distinctly proportional changes of X-ray angle and mean perimeter, leaving the number of helical turns of the cellulose deposit uniform per unit length of fibre. On the other hand, since the length of the helical turn varies from species to species, and can be made subject to selective change within a species, it is tentatively suggested that this characteristic is directly dependent upon the genotype."

1387 *Kirchner, C. & Eisenstark, A. The influence of divalent cations on frequency of recombination in* E. coli *K12 and transduction in* S. typhimurium. *(pp. 381–82).*

Experimental results are described which are compatible with the hypothesis that divalent cations connect genetic units in the above organisms.

1388 *Laughnan, J. R. The origin of noncrossover derivatives from certain A^b: Peru complexes in maize. (p. 382).*

"Several A^b (beta : alpha) alleles of Peruvian origin yield spontaneous noncrossover and crossover alpha derivatives with relatively high frequency (ca. 1/1000) and for this reason were chosen for an intensive analysis of the possibility that the noncrossover alpha derivatives may result from gene mutation of the beta element to a null level. The following observations suggest that these derivatives are not ascribable to gene mutation: (1) mutations of the isolated beta element, measured in the A^b/beta heterozygote, are far less frequent than expected; (2) if gene mutation of beta is responsible for the occurrence of noncrossover alpha derivatives, the latter should carry a null element in the beta position in the complex. Preliminary studies designed to isolate the hypothetical null element have given negative results; (3) recent experiments suggest that the beta element of these A^b complexes of Peruvian origin is itself a complex of at least two elements separable by crossing over. Thus the spontaneous occurrence of noncrossover alpha derivatives from these complexes would require the simultaneous mutation of more than one element.—Gene mutation, gene conversion inhibition based on a Ds-Ac-like system, and multiple crossovers in short segments have been suggested to account for rather similar cases in Aspergillus and Neurospora. These and other possibilities are considered in the light of evidence indicating that the A^b complexes are duplications."

1389 *Levine, M. & Curtiss, R. Genetic studies with mutants of phage P22 affecting lysogenization of* Salmonella typhimurium. *(p. 383).*

The characteristics of three clear-plaque mutants, c_1, c_2 and c_3, of the above phage are described. The genetic sites of the mutants were found to be situated in a circumscribed region of the phage linkage map with the c_1 and c_2 mutants in two distinct, nonoverlapping regions and the c_3 mutants in two groups separated by the c_2 region. The four regions are closely linked and, together with the individual mutations, may be arranged in linear order. The following observation is made: "Taylor's suggestion that the DNA of chromosomes might be arranged as specifically attached side chains on a backbone has not been experimentally substantiated in P22 if a functional unit is equated to a side chain."

1390 *Lindegren, C. C. & Lindegren, G. The effects of constantly occuring localized crossovers and polarized centromeres on tetrad analysis in Saccharomyces. (pp. 383–84).*

"In tetrad analysis, linkage is defined as deviation from a 1 : 1 : 4 ratio of tetrad types, I, II, and III and is expressed in five fundamental distributions: (1) N, 1 : 1 : 4, (2) L, $> 1 : < 1 : < 4$, (3) R, $< 1 : > 1 : < 4$, (4) F, 1 : 1 :

$<$ 4 and (5) T, 1 : 1 : 4*. L-distributions (conventional linkage) occur in all progeny of hybrids between certain genes: (1) the triplet of genes controlling the syntheses of anthranilic acid, isoleucine and histidine, (2) the pair of genes controlling the fermentation of galactose and resistance to anisomycin and (3) the pair controling synthesis of methyl-α-D-glucopyranoside and resistance to cadmium.—F-distributions, in which tetratype is less than unity, and R-distributions are unequivocal evidence that the genes involved are linked to the respective centromeres of two different chromosomes. A pair of genes which occur in an R-distribution in one hybrid may be expected to occur in an L-distribution in another depending upon whether the centromeres are preferentially segregated to the same or opposite poles. The same genes sometime occur in F-distributions in still other hybrids.—An extreme T-distribution is evidence for the occurrence of a localized crossover at every meiosis between the pair of genes involved. The constantly occurring crossover is characterized by its tendency to shift in position along the chromosome and to occur in different regions in specific hybrids. A T-distribution may be superimposed upon L-, F- or R-distributions. Pedigrees demonstrating deviation in tetrad-distributions of the progeny of different hybrids will be described."

1391 *Paliwal, R. L. & Hyde, B. B. The effect of calcium and magnesium on chiasma frequency in* Plantago ovata. (*p. 387*).

Plants deficient in calcium showed a highly significant increase in chiasma frequency and those deficient in magnesium a less significant increase. An excess of calcium also resulted in a highly significant increase but an excess of magnesium had no effect.

1392 *Partridge, C. W. H., Nelson, N. J. & Giles, N. H. Genetical restoration of a specific enzyme activity in Neurospora.* (*p. 388*).

None of a series of 15 induced back mutants from a single adenineless allele showed a specific activity of more than 55% of the parental wild type but among 12 adenine prototrophs derived from four different interallelic crosses activities ranging from 75% to 125% were observed. In all asci examined from crosses between two different mutants and a parental wild type marked at a closely linked locus, 2 : 2 segregations were observed between marked wild type and back mutant strains, the latter showing specific activities of about one half those of the wild type.

1393 *Perry, T. O. & Wang, C. W. Genetic variation in the winter chilling requirement of red maple* (Acer rubrum). (*p. 388*).

The amount of cold treatment required for the breaking of dormancy was found to vary considerably between specimens collected from localities throughout Canada and the USA and it is concluded that the winter chilling requirement is controlled by a number of genes or alleles and that the pattern of genetic variation is clinal and is correlated with the length of the frost-free season in the area from which the seed was obtained.

1394 *Peterson, P. A. A new mutable at the A_1 locus in maize (a_1^m).* (*pp. 388–89*).

This unstable allele is characterized by a change from its colourless form, designated a_1, to the coloured condition, A_1, in the kernel, resulting in a variegated kernel. Different patterns of variegation may be distinguished and are inherited as definite properties of a_1^m, which may also mutate to a colourless, stable condition designated a^s, manifest either in individual germinal mutations or as somatic sectors on the ear. The introduction of a_1^m into pg^s stock [cf. XXIII, 1157] failed to cause pg^s to become mutable, suggesting that a_1^m lacks the mutator *En* and that two different systems control the mutability of pg^s and a_1^m. Further, a_1^m does not require the dotted gene, *DT*, to be mutable and no evidence of *Ac* activity has been obtained.

1395 *Pittman, D. & Lindegren, C. C. Implications from radiation studies on the fine structure of the gene.* (*p. 389*).

"Ultraviolet and X-rays studies, in conjunction with tetrad analysis, on the degradation and regeneration of the melezitose gene (*TMSGZ*) in Saccharomyces indicate that the gene occurs in at least seven configurations, each of differing sensitivity to ultraviolet. Degradation of the *TMSGZ* gene by ultraviolet is sequential (*TMSGz, TMSgz . . . tmsgz*) rather than random, while regeneration of the *tmsgz* allele by X-rays is abrupt (*TMSGZ*) rather than stepwise. The degraded alleles induced by X-rays thus far have been principally *TMSgz* and *tmsgz*. The *tmsgz* allele is refractile to back mutation by ultraviolet but can be reversed by X-rays. The observed radiation effect, coupled with genetic studies, can be interpreted as an intragenic phenomenon.—The ultraviolet-induced alleles of the gene undergo gene conversion in the heterozygous state, acting as donor or recipient

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* Presumably 1 : 1 : $>$ 4 as in an earlier paper [XXVII, 35].

of a specific genetic pattern or configuration, depending upon the allelic state. Beadle's hypothesis of miscopying cannot explain the 0 : 4 ratios observed in genetic analyses of such crosses. The occurrence of induced mutations at 3 loci (*TMSGZ, SU, MA*) in cells plated on nonselective media indicate that the radiation effect extends over segments of the chromosome or is controlled by postradiation substrates.—These findings indicate that radiation-induced reorganization of the fine structure of the gene to the dominant state is not random and can be controlled by specific postradiation substrates."

1396 *Richter, A. Complementary determinants of an Hfr phenotype in* E. coli *K–12. (p. 391).*

Mating studies using F−, F+ and strains of Hfr are described.

1397 *Shifriss, O. Sex expression in Ricinus. (p. 394).*

At least four types of female are known in this genus. The first are genetically stable females carrying the genes ($+S^u$), $+^{id}$ and *f*; the second are thermophotoperiod-induced sex-reversals carrying the genes ($+S^u$), *id* and *f*; the third group, (Su^{ml}), $+^{id}$, $+^f$, form a graded series of female sex-reversals, giving a spectrum of sex-reversals and monecious individuals, while the fourth group consists of a nearly stable category of nonreverted females, (Su^{u2}), *id*, $+^f$, giving over 95% nonreverted females. "Symbol Su^m stands for an unstable group of dominant nuclear factors which convert monoecious individuals, $+^f$, into females and determine the time of occurrence or nonoccurrence of phenotypic reversion to monoecism; *id* stands for a thermophotoperiod requiring gene of unique behaviour which brings about physiologically-induced staminate flowers in otherwise female differentiating tissue." Anomalies in the behaviour of exceedingly late reverted females of the third group are discussed. [Cf. XXVI, 3630].

1398 *Singleton, W. R. & Caspar, A. L. The Blandy radiation field for treating growing plants. (p. 395).*

A γ-radiation field similar to that at the Brookhaven National Laboratory has been set up at the Blandy Experimental Farm, University of Virginia, Boyce, Va. It is hoped to use it both for plant breeding purposes and for obtaining information regarding the sensitivity of various stages in the meiotic cycle and premeiotic stages.

1399 *Sire, M. W. & Nilan, R. A. The relation of oxygen to induced chromosome breakage in* Crepis capillaris. *(p. 395).*

Preirradiation and postirradiation treatments of dry seeds increased the frequencies of X-ray-induced dicentrics and fragments and in addition the ratio of isodiametric fragments to rod fragments increased with the length of post-irradiation storage in oxygen.

1400 *Sparrow, A. H., Pond, V. & Sparrow, R. C. Evidence for time of occurrence of the tertiary split in meiotic chromosomes of* Trillium erectum. *(pp. 397–98).*

Evidence has been obtained that pachytene chromosomes of *T. erectum* are "not effectively quadripartite to irradiation but that diplotene, diakinesis and first metaphase chromosomes are."

1401 *Srb, A. M. Intra-colony selection of prototrophs occurring spontaneously in an adenine-requiring strain of yeast. (p. 398).*

Back mutants having a white, adenine-independent phenotype have been observed in colonies of a red, adenine-requiring yeast at pH 4·5 or in low-sugar media. Since prototrophic cells occur in cultures buffered to pH 5 or containing low sugar concentrations it is concluded that the appearance of the prototrophic cells in large numbers is the result of selection.

1402 *Suyama, Y. & Woodward, V. W. Genetic analysis of pyrimidine mutants of Neurospora. (p. 400).*

On the basis of their physiological characteristics 15 new pyrimidine mutants fall into four groups and all but one have been found to be located between *Pyr–1* and *Pyr–3* on the right arm of linkage group IV. They fall into three or four groups which do not correspond to the four groups separated by phenotypic differences. [Cf. Abst. 1406].

1403 *Taylor, J. H. Sister chromatid exchanges in tritium labeled chromosomes. (pp. 400–01).*

Studies similar to those reported earlier [XXVII, 2508] have been carried out using *Bellevalia romana* and similar results obtained. A high frequency of sister chromatid exchanges was observed, the greater number of which occurred during the first division cycle in the presence of colchicine or tritium-labelled thymidine.

1404 *Wang, C.-W. & Perry, T. O. Hereditary variation of the breaking of dormancy and the photoperiodic response in Betula. (p. 401).*

Distinct differences have been observed in the photoperiodic responses and breaking of dormancy of plants of *Betula* spp. from different regions. Some correlation has been found between the temperature required for the breaking of dormancy and the temperature conditions of the region where the plants originated and also, under uniform day lengths, between the cessation of terminal growth and the latitudinal origin of the plants. The progeny of intraspecific crosses between plants of different geographic origin show characters intermediate between those of the parents.

1405 *Weinstein, A. Evidence that a short region can not contain more than one exchange. (pp. 401–02).*

"(1) Since there is at least one way of dividing every even number into two odd numbers, and every odd number above 1 into three odd numbers, a multiple-crossover region of a chromatid is divisible, if nonrecombinant, into two recombinant regions; if recombinant, into three. Short regions (not exceeding 5 to 15 units, varying with location) cannot be so divided; hence they cannot contain more than one exchange.—(2) Replacement of single by multiple exchanges would, in general, produce too few tetratypes and attached-X homozygotes; replacement of noncrossovers by multiples would not sufficiently counteract this.—(3) In a short region of a tetrad, multiple crossing over producing four recombinant chromatids does not occur. Multiples producing four nonrecombinants are impossible because, not being directly detectable, they would, like sister-strand exchanges, decrease chances of detecting crossing over and hence would cause discrepancies; e.g., negative tetrad frequencies and too few tetratypes and attached-X homozygotes. If multiples producing two recombinant and two nonrecombinant chromatids in a short region are assumed, it is difficult to see what mechanism can prevent multiples producing four recombinants or four nonrecombinants. The discrepancies and difficulties are not avoided if a multiple is assumed to consist of one or more clusters of exchanges such as apparently occur in pseudoallelic crosses. They are avoided if a short region contains no multiples.—These and other considerations invalidate Shult and Lindegren's criticisms of the crossing over theory of Drosophila workers." [Cf. XXVII, 1026].

1406 *Woodward, V. W., Munkres, K. & Suyama, Y. Pyrimidine biosynthesis in Neurospora. (p. 403).*

All the loci differentiating 15 pyrimidine-requiring mutants of *Neurospora* sp. were found to be located on the right arm of linkage group 4 and to fall into at least five distinct groups. [Cf. Abst. 1402].

1407 Žukovskij, P. M.
(Remarks on the use of heterosis and polyploidy in plant breeding).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : 43–48. [Russian].

The use of male sterility for the production of hybrids is exemplified by work carried out in the USA with sorghum, onions and sugar beet and in Bulgaria with tomato, pepper and egg plant. In the USSR useful hybrids have been produced by crossing cucumbers, the best hybrid combinations being indicated. Some promising tomato hybrids have also been produced and cabbage hybrids are distinguished by greater earliness and freedom from bolting.

Attention is called to the value of polyploids in a number of crop plants and to simplified methods of producing them [cf. XXV, 2708].

1408 Cicin, N. V.
(Achievements of Soviet science in the realm of distant hybridization).
Materialy Sessii, posvjaščennoj 40-letiju Velikoj Oktjabrskoj socialističeskoj revoljucii. **(Proceedings of a session devoted to the 40th anniversary of the October socialist revolution).**
Vsesojuznaja Ordena Lenina Akademija Sel'skohozjajsvennyh Nauk imeni V.I. Lenina, Moskva 1957 : Pp. 20.

In outlining the significance of distant hybridization both in evolution and in plant breeding the speaker in this address stated categorically that it is impossible for one species or genus to arise out of another, except by hybridization, which leads to new combinations of characters. This is illustrated by a description of perennial wheat No. 2 from crosses of *Triticum* x *Agropyron glaucum*. So far it has not been possible to overcome the sterility of hybrids of *Triticum*, *Hordeum* and *Secale* with *Elymus*. The sterility of many of the *Triticum* x *Agropyron* crosses can be reduced somewhat by back crossing but more effectively by repeated crossing with some other, distantly related, species or genus; for instance in (*Triticum* x *Agropyron*) F_1 x *Secale* the fertility has been as high as 50% in some crosses. In attempts to combine perennial habit with grain of good quality, segregates from the cross in different generations are intercrossed, the choice of plants for crossing being made on the basis of a combination of desired characters and fertility, a sterile segregate being crossed with a fertile and *vice versa*. In choosing the initial parents it has been found that for the production of hardy forms with a winter habit the best results are obtained from winter forms of *A. glaucum* in which good ear formation persists for 15 or more years; though persistence and winter habit are strongly correlated the association is not absolute. The selection is performed on material grown under conditions of very low soil fertility; embryos of low viability can sometimes be induced to develop by growing them in special culture solutions, if necessary after removal from the endosperm.

Among the practical achievements of the work, *Triticum-Agropyron* hybrids 599, 186 and 1 are mentioned [cf. XXVI, 274–94], and two new hybrids, 1723 and 1800, are about to be released; all these are winter varieties; the most successful hybrids in the spring group are 56 and 173, the former having ripened 10–15 days before other spring wheats and given the same yields; hybrid 7 also combines earliness with high yield. Other hybrids that are under trial are capable of yielding up to 100 c. per ha. of high-quality hay, with up to 16% of protein, in 3–4 cuts or alternatively a crop of grain followed by 1–2 crops of hay.

Examples are cited of other useful varieties produced in the Soviet Union by crossing wheat x rye, *T. durum* x *T. aestivum*, spring x winter wheats, Upland x perennial cottons, sugar beet x wild beet, *Nicotiana rustica* x *N. tabacum*, *Cucurbita* x *Cucumis*, *Helianthus tuberosus* x *H. annuus*, *Medicago sativa* x *M. falcata*, as well as species of potatoes, tomatoes and many vegetables, fruits, forest trees and ornamental plants.

1409 LINNIK, E. F.
(Atomic energy at the service of agriculture).
Nauk. pered. Opyt Sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 9 : 74–76. [Russian].

The use of radiation to obtain improved varieties of crop plants or fruit trees by Western geneticists is reviewed.

1410 CHIEN, T.-H.
(Radioactive isotopes and the future of agricultural development).
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1957 : No. 18 : 1–6. [Chinese].

Applications of radioactive isotopes in agricultural research are reviewed. Work has begun in Taiwan on irradiation of groundnuts and soya beans to produce new mutants.

1411 DORST, J. C.
Adaptation.
Euphytica, Wageningen 1957 : **6** : 247–54.

The author discusses various aspects of the problem of adaptation from the point of view of the plant breeder. In the case of the development of new plant associations, changes in pasture vegetation and the origin of local varieties, the Darwinian concept of adaptation through natural selection is considered to be completely applicable. In considering land races, populations of improved varieties of field crops and grasslands which have reached some degree of equilibrium, adaptation involves a compensatory process in that a general tendency to fluctuate around an average behaviour is expressed. In the case of self-fertilizing crops, multiline varieties may not however have advantages over pure lines, as has been shown by the author's experience with flax. Adaptation of clones and pure lines of self-fertilizing plants is based solely on the ability of the phenotype to be modified. Finally, adaptation of parasites and symbiotic organisms in relation to their hosts is considered. Adaptation in this case implies a certain restriction rather than an amplitude of response.

1412 Rassenlijst voor landbouwgewassen 1958.
(Varietal list of agricultural plants, 1958).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : p. 89.

Notes are presented on the agronomic characteristics of 21 varieties of cereals, grasses, lupin, root crops, potato, pea and bean, to be added to the Netherlands varietal list for the first time. Information on breeders and seed producers is included.

1413 RICHHARIA, R. H.
Improved varieties of crop plants of Bihar.
Tech. Bull. Bihar Acad. agric. Sci. 1954 : No. 2 : Pp. 76.

This review of breeding so far carried out in Bihar consists mainly of descriptions of the varieties developed among the cereals, pulses, oilseeds, millets, fibre crops, vegetables, tuber crops, spices and condiments.

1414 GLAVINIČ [GLAVINIĆ], R.
(Transformation of plants).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 4 : 23–33. [Russian].

Germinating grains of the winter wheat Kooperatorka when vernalized for 30 days at 0–2° C. gave only 67 grains from 20 plants whereas the control plants from seed vernalized for 40 days produced 450 grains. The 67 grains were sown on 25 October 1947 in a greenhouse at a temperature of 20–25° C. and all eared and produced a crop of grain in February 1948 whereas the plants from the control grains failed to ear. Grains of the first generation when sown in April 1948 matured on 2 August, the second generation matured in 75 days as compared with the 62 days required by the standard spring wheat Lutescens 062, and the third generation matured in 70 days.

By transferring 20 young seedlings of *Gossypium hirsutum* 'Big Boll' to a greenhouse at 5–15° C., seed was obtained from 5 of them and this when sown in March 1950 gave rise to 150 seedlings, of which 24 survived; they ripened 17 days later than the standard variety for Macedonia, No. 78; the second generation 10 days later and the fourth 12 days. The selection at this stage was considered to be a new cultivar and named Makedonka [Macedonian]; it had a lint length of 27–28 mm. and a ginning percentage of 26; in the fifth generation, in 1954, it yielded 1040–1685 c. of raw cotton per ha. in areas where the average yield was 600–800 c.; in 1955 it yielded 2000–2800 c. per ha. and ripened at about the same time as the standard varieties.

1415 LEHMANN, C. O. & MANSFELD, R.
Zur Technik der Sortimentserhaltung. **(The technique of maintaining collections).**
Kulturpflanze, Berlin 1957 : **5** : 108–38.

In discussing the importance and special difficulties attached to the permanent maintenance of collections of crop-plant varieties one of the problems specially stressed is that of maintaining purity. The methods used in maintaining the large collections at Gatersleben in eastern Germany are described, with illustrations. Measures are taken to prevent mechanical admixture, and alterations due to selection effects, hybridization and mutation. Care is taken to plant forms differing in some obvious morphological character and if possible also flowering time in adjacent plots.

1416 JAMES, E.
Progress and potentials in plant introduction for the south.
Sth. Coop. Ser. Bull. 1955 : No. 27 : Pp. 42.

A review is presented of the work accomplished with forage, horticultural and other crops, since the establishment in 1949 of the Primary Plant Introduction Station for the Southern Region. The performance of promising foreign introductions and current breeding work are briefly reported.

1417 ŽUKOVSKIJ, P. M.
(World resources of plants in the service of Soviet plant breeding). Materialy Sessii, posvjaščennoj 40-letiju Velikoj Oktjabrskoj socialističeskoj revoljucii. **(Proceedings of a session devoted to the 40th anniversary of the October socialist revolution).** Vsesojuznaja Ordena Lenina Akademija Sel'skohozjajsvennyh Nauk imeni V.I. Lenina, Moskva 1957 : Pp. 16.

Material recently added to the world collection of crop plants at the Institute of Plant Industry, Leningrad, from the Caucasus includes subspecies of *Triticum timopheevi* with 28, 42 and 56 chromosomes; an extremely polymorphous weed species of rye, *Secale segetale*, some forms of which have large white grains with high protein content; winter barleys with strong straw; and the Colchic wheats distinguished by high grain quality. Attention is called to the value of high-yielding unbranched forms of *Triticum turgidum*, as opposed to the branched forms which are little or no use; *T. carthlicum* is mentioned as useful on account of its tolerance of cool climates, diseases, rain and fog; the barleys of Asia Minor are resistant to drought and *Fusarium*. Male-sterile lines have been selected from the maize varieties of Moldavia and Osetia, other selections restore fertility, and some promising hybrids such as VIR 327 [Institute of Plant Industry 327] have been produced from them. From the South American potato collection varieties have been produced which give two crops a year or are resistant to wart, *Oospora*, Colorado beetle and *Epilachne*; in addition to frost-resistant species there are those such as *Solanum antipoviczii* with a dry-matter content of 38·66%, *S. emmeae* with 27·8% of starch and *S. baccale-albescens* with up to 6% of protein; forms resistant to viruses Y, S and X appear in several species.

Resistance to virus yellows occurs in *Beta lomatogona*, *B. patellaris* and *B. procumbens*; *B. lomatogona* has monogerm seed and tetraploid forms are present in the collection. From crosses with *Helianthus lenticularis* a sunflower, G–1219, has been produced which is resistant to rust and *Orobanche*. Fodder water melons, selected from specimens in the collection, are meeting with success in arid zones; others containing 18%

pectin are being used for the production of agar-agar substitutes. Other interesting forms in the collection include diecious cucumbers and water melons and male-sterile onions, sorghums, and sugar beet, suitable for the production of hybrid seed. Selfed lines from local maize varieties have been used to produce double-cross hybrids such as VIR281, which has exceeded VIR42 by 3·5 c. per ha. in grain yield.

The collections are grown for study in representative areas of all the main ecological zones of the Soviet Union. Examples are given of specimens, such as cassaba and cantaloupe melons from Asia Minor, which have been introduced directly into cultivation. Others have served as material for selection, 12 varieties having been selected from one sorghum population. The value of recently developed methods of rapid analysis of small quantities of material for carrying out such selection work is pointed out and it is suggested that such methods might be used with advantage in Soviet plant breeding work, which has so far been directed more towards yield than towards quality or disease resistance. Other special methods referred to include chromosome duplication, whereby it has become possible to cross *Solanum polyadenium* with domestic potatoes and produce hybrids resistant to late blight, virus Y and Colorado beetle. The advantages of polyploid forms of crop plants are illustrated by reference to triploid sugar beets and water melons. By crossing different forms from the collection marked improvements in certain qualities can be effected; thus hybrids between the Moldavian grape Rară Neagră [Black Rară] and a Far-eastern form have berries containing 26–28% of sugar. The collection is also thought to be an invaluable source of material for producing induced mutations, reference being made to work in this direction carried out in Sweden, the USA and Germany.

1418 KUČERENKO, V. S. & SMYSLOV, B. V.
(Some questions of seed-production work).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 32–36. [Russian].

In describing the work of a seed-production farm in the Stalingrad area it is stated that even when the foundation stock failed to arrive from the breeding station and seed from later generations of reproduction was used, the results were just as good. The view is expressed that the so-called degeneration of varieties is largely due to loss of purity.

1419 STROGONOV, B. P.
(Theory and practice of improving the resistance of plants to salinity in the USSR).
Chi-wu-hsueh Pao/Act. bot. sinica 1957 : **6** : 161–73. [Chinese]; also 174–88. [Russian].

Agrobiological methods used in the USSR for improving the resistance of crop plants to soil salinity are described, in particular the author's own work with cotton. Intravarietal crossing of cotton followed by selection in the F_2 is regarded as a promising method for breeding for resistance to salinity.

1420 SJØSETH, H.
Studies on frost hardiness in diploid and autotetraploid red clover (*Trifolium pratense*) and winter rye (*Secale cereale*).
Hereditas, Lund 1957 : **43** : 679–82.

A short report is given of artificial freezing tests carried out at the Agricultural College of Norway on diploid and tetraploid red clover, the results of which have been given in more detail in another paper [XXVII, 4080]. The results of such tests on diploids and tetraploids of the ryes Grårug [Grey rye], Kungsråg II [King II rye] and Bjørnråg [Bear rye] are also summarized. Rye seedlings with two or three leaves were exposed to – 12 to – 16° C. for 5 hr. In both crops, the tetraploids were less resistant than the corresponding diploids, as indicated by survival percentages. The results with both crops indicated however that hardy tetraploids may be obtained if sufficiently frost-resistant diploid progenitors are used.

1421 **[The oldest plant breeder in the country. (The 80th birthday of Prof. P. N. Konstantinov)].**
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 37–38. [Russian].

The 22 varieties produced by P. N. Konstantinov include the drought-resistant wheat Erythrospermum 841, successful varieties of spring barley and *Agropyron cristatum* and some hybrid lucernes.

1422 STAKMAN, E. C.
Fortschritte und Probleme bei der Schaffung krankheitsresistenter Kulturpflanzen. **(Advances and problems in the development of disease-resistant cultivated plants).**
Umschau 1957 : **57** : 737–40.

In this popular survey, which includes a discussion of breeding for resistance, a plea for greater facilities for testing plants for disease resistance is put forward.

Abstracts of papers accepted for presentation at the Forty-Ninth Annual Meeting of the American Phytopathological Society, Palo Alto, California, August 26, 27, 28, 1957. Phytopathology 1957 : **47** : 515–39.

1423 *Alexander, L. J. Ohio W–R Seven, a new disease-resistant globe-type glasshouse tomato variety. (p. 515).*

The above glasshouse variety carries the dominant *I* gene for resistance to race 1 of *Fusarium oxysporum* f. *lycopersici* and is also resistant to blotchy ripening and is free of pox. It is of midseason maturity and gives yields similar to those of Ohio W–R Globe. Details of its origin are not given.

1424 *Allison, P. & Christensen, J. J. The mutagenic and injurious effect of filipin on* Helminthosporium sativum. *(p. 515).*

Mutation frequency of *H. sativum* was found to be greatly increased by the use of filipin, the mutants differing from their parents morphologically and physiologically in varying degrees.

1425 *Bellingham, R. C., Fellows, H. & Sill, W. H. (Jun.). Resistance to wheat streak mosaic virus in foreign and domestic wheats and various wheat crosses. (p. 516).*

Most of the 4541 varieties tested over a seven year period were susceptible to the above virus but a few winter varieties were tolerant. Resistance was found only in a few wheat x *Agropyron* and wheat x rye hybrids of doubtful agronomic value.

1426 *Bolton, A. T. & Racicot, H. N. Cultural races of* Mycosphaerella fragariae. *(p. 517).*

A total of 32 types of culture of the above fungus were isolated from commercial and wild strawberries from Nova Scotia, Louisiana and France. They varied in colony colour and surface appearance, rate of growth, texture of stroma and to a certain extent in pathogenicity. Variations or mutations of the fungus in culture were more frequent in some races than in others.

1427 *Bridgmon, G. H. The production of new races of* Puccinia graminis *var.* tritici *by hyphal fusion on wheat. (p. 517).*

When race 121 of the above fungus was injected into wheat plants with either race 9 or 11 the resulting infection yielded two undescribed red races and four subraces, all differing in pathogenicity from the parent races. Most of the new isolates were obtained more than once from successive mixtures, indicating that they had arisen by hyphal fusion within the host.

1428 *Buddenhagen, I. W. Ultraviolet- and X-ray-induced mutation in* Phytophthora cactorum. *(p. 517).*

Mutants differing in size and morphology of colonies, sporulation, size, shape and papillation of sporangia, size of oospores, hyphal type, growth on minimum medium and pathogenicity to peach were obtained. Some mutants differed sufficiently from *Ph. cactorum* to make their identification impossible without knowledge of their origin.

1429 *Endo, R. M. Evaluation of resistance in oats to the barley yellow-dwarf virus. (p. 520).*

No plants showing more than moderate resistance were found in over 4000 selections of *Avena* spp.

1430 *Flangas, A. L. & Dickson, J. G. A method for detailed genetic analysis of pathogenic loci in rust fungi, and genetic analysis of pathogenicity in* Puccinia sorghi. *(p. 521).*

The method used for determining the genic status of a locus for pathogenicity in *P. sorghi* is briefly described. Eight pathogenic types have been recovered from 96 subcultures obtained from four cultures inbred through *Oxalis corniculata* and it is suggested that "gene pools appeared to condition specific pathogenicity in the dicaryon of *P. sorghi* for specific alleles in the host as well as a specific gene-for-gene interaction". [Cf. XXVI, 2090 and XXVII, 2947].

1431 *Gaskin, T. A. & Schafer, J. F. Developmental and genetic bases of resistance of wheat to loose smut. (p. 521).*

The following observations have been made: (1) maternal tissue of Tremezino (PI191704) inhibits penetration of *Ustilago tritici* in F_1 plants of crosses with Knox, (2) the embryo in Hope-Hussar (CI11682) excludes the pathogen and (3) the fungus shows reduced ability to invade the growing point following seed germination in Riette (PI191749) and is unable to maintain itself in the growing point of Kawvale (CI8180). It is suggested that there is a relationship between the number of stages of development at which resistance is expressed and the number of genes conditioning reaction to this pathogen.

1432 *Govindu, H. C. & Fischer, G. W. Cultural variants in* Ustilago striiformis. *(p. 522).*

Considerable variation in cultural characters was observed between over 40 collections of the above fungus from 34 grass species.

1433 *Henson, L. & Buckner, R. C. Resistance to* Helminthosporium dictyoides *in inbred lines of* Festuca arundinacea. *(p. 523).*

Differences in resistance to the above fungus were noted between one second-generation and two third-generation inbred lines, one of the latter being highly resistant.

1434 *Holton, C. S. & Dietz, S. M. Haploid lethal factors associated with two unique sorus types in the oat smut fungi. (pp. 524–26).*

Lethal factors preventing haploid development in culture have been found in association with two distinct sorus types in the above fungus. In one, the buff smut fungus, the lethal factor segregates independently of the two sex compatibility factors while in the other, an exposed, indurate type, a specific association between the lethal and sex-compatibility factors is indicated.

1435 *Houston, B. R. & Ashworth, L. J. (Jun.). Newly determined races of the barley scald fungus in California. (p. 525).*

At least five races of *Rhyncosporium secalis* have been found among 28 isolates, from widely separated localities in California, tested on seven differential varieties. Striking variability was noted in cultural characters and sporulation of the races.

1436 *Kahn, R. P. & Dickerson, O. J. Susceptibility of rice to systemic infection by three common cereal viruses. (p. 526).*

None of the 18 rice varieties tested were susceptible to three isolates of wheat streak virus or to barley stripe virus obtained from plants grown from infected seed. Three varieties were susceptible to two isolates of brome mosaic virus and these three with four others to one isolate of barley stripe virus.

1437 *Kim, W. S. & Hagedorn, D. J. Studies with virus incitants of pea streak. (p. 526).*

On the basis of symptomatology and differential host reaction, 47 isolates of viruses responsible for pea streak from various parts of the United States were placed in five groups whose characteristics are here briefly described.

1438 *Lal, S. B., Sill, W. H. (Jun.), Del Rosario, M. S. & Kainski, J. M. Three new naturally occurring strains of wheat streak mosaic virus in Kansas and the Great Plains. (p. 527).*

Of 414 samples of wheat streak mosaic virus collected in the above region 360 were the yellow strain. The remainder included the green strain and three new types, here designated the white mottle, leaf rolling and leaf striping strains.

1439 *Meiners, J. P. Spore germination and cytology of* Tilletia scrobiculata. *(p. 528).*

The germination characteristics of the spores of the above fungus are described. Since the primary sporidia are multinucleate and do not fuse it is suggested that this species is homothallic.

1440 *Meiners, J. P. & Waldher, J. T. Compatibility relationships in species of* Tilletia. *(p. 528).*

The results of intraspecific and interspecific matings between pairs of primary sporidia of five species of *Tilletia* indicate that sporidial fusion within a species is usually controlled by one factor pair. In *T. bromi-tectorum*, *T. caries* and *T. foetida*, production of infection hyphae is similarly controlled but in *T. fusca* and *T. guyotiana* the lower percentage of infection hyphae produced is taken to indicate the presence of sterility factors. The results of interspecific matings suggest the presence of multiple alleles governing fusion between species and a single factor pair governing the production of infection hyphae.

1441 *Narvaez, I. & Caldwell, R. M. Inheritance of resistance to leaf blotch of wheat caused by* Septoria tritici. *(pp. 529–30).*

Segregation in the progeny of crosses between a resistant variety, Nabob, and two susceptible varieties, Knox and Vermilion, indicated that resistance is controlled by two independent, partially dominant genes whose effect is additive. In the case of crosses between the resistant varieties Lerma 52 and P14 and the susceptible varieties Lee and Mayo 54 segregation indicated that a single dominant gene for resistance operates in both Lerma 52 and P14.

1442 *Simons, M. D. Variability among strains of noncultivated species of oats for reaction to races of the crown rust fungus. (p. 534).*

Out of 200 strains of oats representing the major wild species of *Avena*, tested for reaction to eight races of *Puccinia coronata* var. *avenae*, 44 strains showed some resistance to at least one race and the reactions shown by these strains indicate that at least 21 different genetic systems for reaction are in operation. Strain CI3815 of *A. strigosa* was highly resistant to all eight races and to 800 additional isolates and strain PI193958 of *A. abyssinica* was almost equally promising. A few strains which were susceptible as seedlings developed field resistance later.

1443 *Stover, R. H. Ecology and pathogenicity studies with two widely distributed types of* Fusarium oxysporum *f.* cubense. (*p. 535*).
Cultural and pathogenic differences between the two strains of the above fungus, causing banana wilt, are described.

1444 *Threinen, J. T., Kommedahl, T. & Klug, R. J. Hybridization between radiation-induced mutants of* Diaporthe phaseolorum *var.* caulivora *and* D. phaseolorum *var.* sojae. (*pp. 535–36*).
Mutants obtained by α-irradiation of *D. phaseolorum* var. *caulivora* were found to differ in fertility but the number of complete or perfect perithecia produced by less fertile mutants was increased in crosses with *D. phaseolorum* var. *sojae*. Segregation after two generations in a hybrid between the two varieties resulted in recovery of the maternal parent, *D. phaseolorum* var. *caulivora*, but not of the heterothallic parent, *D. phaseolorum* var. *sojae*.

1445 *Toko, H. V. & Bruehl, G. W. Strains of the cereal yellow-dwarf virus differentiated by means of the apple-grain and the English grain aphids.* (*p. 536*).
Of 34 isolates of the cereal yellow dwarf virus, 32 were transmitted by both *Rhapalosiphum fitchii* and *Macrosiphum granarium* but the remaining two were vector-specific, one (AG) being transmitted by the former aphid and the second (EH) by the latter. AG differs from the original Washington strain of the virus by being more virulent on Club Mariout barley than on White Winter barley and both the AG and EG strains were more virulent on oats and barley than on wheat.

1446 *Vakili, N. G. & Caldwell, R. M. Recombination of spore color and pathogenicity between uredial clones of* Puccinia recondita *f. sp.* tritici. (*p. 536*).
A total of 16 described races and 17 undescribed races of the above fungus was obtained after a mixture of spores of race 2, which is red, and race 122, which is yellow, was dusted on to five wheat varieties immune to race 2 and susceptible to race 122. This diversity of races was much greater than would be expected if only recombination of intact nuclei between the two parental races were operative as the mechanism of variation.

1447 *Wyllie, T. D. & Walter, J. M. Variation in* Sclerotinia sclerotiorum *induced by irradiation.* (*p. 538*).
Variants differing from the parental stock in colour, rate and type of growth, in size, shape, number and position of sclerotia and in number of apothecia were produced by α irradiation and ultraviolet irradiation of ascospores, mycelial fragments and sclerotia of the above fungus. Preliminary tests indicated marked differences in pathogenicity.

1448 NEKY, E.
Ergebnisse der Getreideversuche des Jahres 1952/53, 1953/54, 1954/55 und 1955/56. (**Results of cereal trials for the years 1952/53, 1953/54, 1954/55 and 1955/56**).
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1956 : No. 34 : Pp. 58; No. 35 : Pp. 53; No. 36 : Pp. 61; 1957 : No. 37 : Pp. 67. (Mimeographed).
Summer and winter varieties of wheat, oats, rye and barley were tested. Data are provided on yield, quality and resistance to lodging and disease.

1449 RUEBENBAUER, T.
Wytyczne do kierunku hodowli zbóż w Polsce. (**Guiding principles for the direction of cereal breeding in Poland**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 461–75.
Breeding objectives in Poland are discussed, the need for improving methods of agricultural production and for breeding varieties adapted to the improved methods being stressed.

Tien-jarenplan voor graanonderzoek. Verslag over het derde jaar—1956. (**Ten-year plan for cereal research. Report for the third year, 1956**),
Nederlands Graan-Centrum : Pp. 132.

1450 *Dantuma, G. Verslag over kruisingsprogramma en klimaatresistentie-onderzoek.* (*Report on the crossing programme and investigations on climate resistance*). (*pp. 11–16*).
Wheat. The severe winter resulted in a high degree of natural selection among crosses involving very winter-hardy varieties but killed many F_2 and F_3 plants from crosses between winter and summer varieties, in which the summer habit was dominant. A number of parental varieties have shown resistance to the yellow rust races 1, 2, 5, 7, 7X and 8. A combination of winter hardiness, earliness and suitability for sandy soils has been obtained in crosses among Russian, American and Finnish varieties. Investigations on resistance to *Cercosporella* foot rot have begun.
Oats. Material for sandy soils is being selected.
Barley. Mildew and yellow-rust resistant survivors of the severe winter, from crosses between winter and summer barleys, have been

used for further breeding. Breeding for tolerance of low pH is also in progress. Promising selections have been made from crosses involving the stiff-strawed varieties Herta and Rika and the German barleys Piroline, Erika and Haisa. Some Ethiopian varieties have been used in breeding for resistance to dwarf rust.

1451 *Belderok, B. & Wiebols, W. H. G. Methodiek bakwaarde-onderzoek van kleine monsters tarwe. (Methodology of research on the baking quality of small samples of wheat). (pp. 17–32).*

Methods used at the Central Institute for Nutrition Research, Wageningen, for carrying out baking tests, dough tests, sedimentation tests and determinations of water absorption, using micro-samples, are described and their results compared with those of standard baking tests.

1452 *Meppelink, E. K. Jaarlijkse registratie van het bakwaardeniveau van de inlandse tarweoogst. (Annual record of the level of baking quality in the Netherlands wheat harvest). (pp. 33–42).*

Information is presented on regional and varietal differences in quality of seven varieties harvested in the Netherlands in 1956.

1453 *Dammers, J. Het onderzoek naar de voor jonge varkens schadelijke faktor, voorkomende in rogge. (Investigations on the factor causing harm to young pigs, occurring in rye). (pp. 55–59).*

Evidence of varietal differences in rye with respect to its depressive effect on growth in pigs when used as fodder is presented.

1454 *van Dobben, W. H. Verslag van proefnemingen op het gebied van het fundamentele graanonderzoek. (Report on experiments in the field of fundamental cereal research). (pp. 81–98).*

The possibility of developing day-neutral maize or varieties with a limited short-day requirement for cultivation in the Netherlands is discussed. An early Turkish variety in the collection at the Plant Breeding Institute appears to be day-neutral and may be of use in breeding.

CEREALS

1455 **Cereal news from Canada.**
Cereal News 1957 : **3** : No. 2 : 11–24.

Wheat. Quality tests carried out in 397 F_6 selections from the cross Redman x RL2265 (McMurachy x Exchange) using dough expansion values and mixogram values showed that about 90% of the lines were poorer than Redman. The release of Kent, previously known as GC361, is noted [cf. XXVII, 3880 and XXVIII, 289].

Oats. Resistance to *Leptosphaeria avenaria* has been observed at several localities in crosses involving Abegweit, notably in 5055 (Garry x M Ukraine 2X Abegweit), and in some strains from wild oats, especially *Avena strigosa*. A list is given of new oat selections possessing resistance to the North American races of *Puccinia coronata* which parasitize varieties such as Landhafer. At Winnipeg the variety Rehovoth from Israel has shown resistance to race 276 of *P. coronata* although differences in reaction between plants have been observed.

Barley. At Charlottetown, PEI, differences in varietal reactions to two isolates of *Helminthosporium sativum* (*Cochliobolus sativus*) have been noted. Three Canadian institutes have taken part in an international programme for testing the reaction of 105 barley varieties to various diseases and in epidemics of scald at Paso, Colombia, and Edmonton, Alta., Coast, Quinn, Osiris, Bey, Turk and CI7751 showed complete field resistance. At Brandon a back-cross programme designed to combine the good agronomic characters and smut resistance of some forage types with the malting quality of Parkland and other varieties is making good progress.

Flax. In the programme of selection of rust-resistant varieties at Fort Vermilion, F_6 progenies from Redwing x Rocket show considerable promise. Some promising early lines of the Redwing type were found to show some degree of rust susceptibility.

1456 Wells, D. G.
Construction and operation of a simple growth chamber.
Agron. J. 1957 : **49** : 566–67.

Details are given of the construction and use of a 12 x 8 x 9 ft. growth chamber found valuable in wheat and barley breeding at the Mississippi State College. Methods employed in growing the potted plants and experience gained in techniques of germinating seed harvested while still green and of vernalizing the seedlings of winter types prior to potting and treatment are described as well as the arrangements for light and temperature control. Apart from its value in saving time in raising breeding material, the chamber may also be used in testing reactions to diseases.

1457 **Cereal news from other countries.**
Cereal News 1957 : No. 2 : 25–33.

Oats. Mention is made of the following varieties recently released in the USA: Ransom (Sac x Hajira–Joanette) in Iowa [cf. XXVII, 3850], Putnam [cf. 230 and 361] and Newton [cf. XXVI, 2354 and 3218] in Indiana, Logan in Illinois [cf. XXVI, 3218], Bronco [cf. XXVII, 1659] in Texas and Crater (Fulghum x Curtis) in Oregon. The last-named variety is a stiff-strawed, high-yielding grey winter oat adapted to southern Oregon and areas in the Willamette Valley where lodging is a problem.

Barley. The parentage of Davie [cf. XXIV, 333] is given as Sunrise x Bolivia. The release of Manon in Belgium is noted [cf. XXVII, 1749].

1458 Trofimovskaja, A. Ja.
(The grain crops of Finland).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : 49–52. [Russian].

In an outline of the achievements of the plant breeding stations of Jokioinen and Tammisto, reference is made to the winter-rye varieties Toivo, Ensi [First], Pekka, Oiva [Excellent], Onni and Visa, the winter wheats Varma, Olympia, Vakka and Antti, the spring wheats Diamant [Diamond], Diamant II, Apu [Aid], Tammi and Kimmo [Elasticity], the barleys Tammi and Pirka, the oats Sisu [Courage], Tammi and Eho and the peas Sinikka, Kalle and Paula.

1459 Vigorov, L. I.
(A rapid method of estimating the protein in wheat and tryptophane in maize).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 66–67. [Russian].

To 0·5 g. of whole wheat meal mixed with powdered glass 2 ml. of 30% NaOH are added; after mixing, 2 ml. of 5% $CuSO_4$ are added and the mixture allowed to stand for 5–6 min., 5 ml. of H_2O are added and the mixture is ground, 10 ml. of H_2O are added and the supernatant liquid, which is violet in colour, is decanted into a graduated test tube. The samples taken in the course of the day are judged next morning by the intensity of the violet coloration compared with that from grain of known composition.

For estimating tryptophane in maize grain the flour with the powdered glass is ground in 1 ml. of concentrated HCl containing 25 mg. of p-dimethylamidobenzaldehyde, the ground mass is washed out in three portions with 3 ml. of dilute HCl each time; 9–10 samples prepared in this way are tested with a drop of 0·5% $CuSO_4$, being placed for 5 min. in a water bath at 70° C. After removal and standing for 3–4 hr. they are judged by the intensity of the blue coloration. The method is not suitable for coloured grains but can be used for estimating tryptophane also in wheat, rye or barley grains.

1460 Matweef, M.
Application de la méthode Kjeldahl au dosage rapide des protéines en vue de la sélection et de la commercialisation des céréales. **(Application of the Kjeldahl method to the rapid determination of proteins with a view to the selection and commercialization of cereals).**
CR Acad. Agric. Fr. 1957 : **43** : 787–95.

In the method described, 1 g. of grain is sufficient for a determination, 200 of which may be made in a day; the error is about 2%.

1461 Lupton, F. G. H. & Whitehouse, R. N. H.
Studies on the breeding of self-pollinating cereals. 1. Selection methods in breeding for yield.
Euphytica, Wageningen 1957 : **6** : 169–84.

"The limitations of the pedigree and mass methods of selection in the improvement of self pollinating cereal crops are discussed and the value of quantitative data in the early generations of selection is emphasised. Two systems of selection which provide such data have been introduced at the Cambridge Plant Breeding Institute, England.

"In one, known as the F_2 progeny method of selection, the progenies of selected F_2 plants are grown in yield trials without further selection during F_4, F_5 and F_6 after which single plant selections are made within the more promising progenies.

"In the other system, known as the pedigree trial method of selection, normal pedigree selection is carried out in F_2 and F_3. In the F_4 generation single plants are selected from the better families for continued pedigree selection and within each of these families the remaining plants are bulked to give grain for a yield trial in the following year. This process is repeated in F_5 and F_6, the grain for trial being in each case obtained from the progeny rows and not from the preceding trial.

"The use of these methods is illustrated by reference to wheat hybrids grown at Cambridge, and the data obtained are shown to be useful in comparing the value of different parental combinations as well as in assessing the relative merits of the selections within each cross."

[Authors' summary].

1462 Wolski, T.
Szeroka rozstawa pól selekcyjnych w hodowli roślin zbożowrych. (**Wide spacing in selection plots in breeding cereal crops**).
Postępy Nauk Roln. 1956 : No. 3–4 : 137–42.

The spacing 25 cm. x 25 cm. is used in the wheat and rye selection plots at the Choryń and Dańków plant breeding stations, Poland. The main advantage, especially with rye, is the large number of spikes and large kernels obtained per plant, so that the method is particularly suited to selecting plants for single-plant progeny testing. Normal spacing is used in such progeny tests. Another effect of the wide spacing is greater morphological variation among plants and families.

1463 Lelley, J.
Adatok az őszi gabonafélék télállóságának új vizsgálati módjáról. (**Data on a new method for investigating winter hardiness in winter cereals**).
Növénytermelés 1956 : **5** : 297–306.

Selection for frost resistance is being effected at Mátraszentlászló, Hungary, where winter temperatures are lower and number of days of frost greater than at Kompolt. A form of screen which prevents the ground in the selection plots from being covered with a protective layer of snow is used, thus ensuring that selection takes place under extremely cold conditions with a high degree of winter killing.

1464 Riegerowa, H. & Muszyńska, K.
Badania nad wyleganiem odmian zbóż. (**Studies of lodging in cereal varieties**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 527–40.

At the Polish Institute of Plant Breeding and Acclimatization, the coefficient of straw stiffness referred to earlier [XXVII, 1618] has proved useful in evaluating winter wheat varieties for lodging resistance, provided the plants are unattacked by pests or diseases. The influence of rate of lignification, lignin content and imbibition capacity of the straw upon the coefficient of straw stiffness is being studied, as is also lodging resistance in the progeny of crosses in winter wheats and spring barleys.

1465 Nover, I.
Sechsjährige Beobachtungen über die physiologische Spezialisierung des echten Mehltaus (*Erysiphe graminis* DC.) von Weizen und Gerste in Deutschland. (**A six-year study on the physiological specialization of powdery mildew (*E. graminis* DC.) of wheat and barley in Germany**).
Phytopath. Z. 1957 : **31** : 85–107.

Ten races of *E. graminis* var. *tritici* were distinguished using six wheat varieties; the geographical distribution of the races in Germany during 1950–55 was determined. Race 4 was most prevalent followed by race 3. The suitability of different wheat varieties for identifying races of mildew is discussed.

In determining races of *E. graminis* var. *hordei*, resistant mutants of Friedrichswerther Berg such as Gatersleben Mutante 511 were found useful. Sixteen races of barley mildew were distinguished by the reaction of eight varieties; races of group C have been increasing and those of group A decreasing.

1466 Nakagawa, K. & Kumada, S.
(**On the outbreak of *Puccinia glumarum* in the prefecture of Fukushima**).
Nihon Shokubutsubyori Gakkai Ho/Ann. phytopath. Soc. Japan 1954 : **19** : 45–52. [Japanese].

Data are provided on the relative susceptibility of locally grown varieties of barley and wheat.

1467 Hesling, J. J.
***Heterodera major* O. Schmidt 1930 on cereals—a population study.**
Nematologica, Leiden 1957 : **2** : 285–99.

Carried out at the Rothamsted Experimental Station, England, this analysis of population increase in relation to the initial population on the wheat Atle, oat S147 and barley Herta has a bearing on the technique of varietal evaluation for resistance to *H. major*. The inocula consisted of cysts which did not pass through a mesh with apertures of 0·556 mm^2. and ranged from 1 to 128 cysts per pot. The percentage of new cysts in each size grade differed with the rate of inoculation and with the host. The proportion of large cysts fell and the proportion of small cysts increased with increased rate of inoculation. The egg content of new cysts belonging to the same size grade was unaffected by the inoculation rate. Evaluation of varietal reactions based on final cyst and egg counts from random samples may therefore give misleading results unless initial rates of infestation are similar. For maximum sensitivity of the technique of testing, use should be made of replications, a series of inoculation rates, an appropriate variety as a standard, pots of soil in order to control soil type and other factors, and a standard eelworm population. Measurement of plant height is regarded as satisfactory for estimating the susceptibility of cereal varieties to injury by *H. major*.

1468 THURMAN, R. L.
Winter small grains research.
Arkans. Fm. Res. 1957 : **6** : No. 3 : p. 6.

The results of oat varietal trials indicate that Ferguson and Nortex 107 may be tolerant of high rainfall. Ferguson gave the highest yield at Stuttgart and Marianna. In the wheat trials, Anderson gave the highest yield at Fayetteville; this variety matures rather late and is not damaged by spring frosts. At Osceola, the barley variety Harbine gave a higher yield than Kenbar and appeared to be less susceptible to lodging; it may also be more water tolerant.

1469 IAZAGI, A. *et al.*
Contribuţii la raionarea soiurilor de grîu de toamnă, orz de toamnă, orz de primăvară si ovăz. (**Contributions to the regionalization of varieties of winter wheat, winter barley, spring barley and oats**).
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 213–79.

Extensive variety trials of the above crops in Rumania are reported. Data are provided on yield and other agronomic characters at a series of stations and recommendations are made on the best varieties for the different regions of Rumania.

1470 COTTIER, K.
Variety trials with cereals.
NZ J. Agric. 1957 : **95** : p. 377.

The main results of trials carried out on wheat, oat and barley varieties during the season 1956–57 in New Zealand are given. Some reselections of the new wheat Aotea have shown better baking quality than the original variety, while maintaining its promise in other respects. Now considered to be similar to Cross 7 in baking quality, Aotea is to be released at a later date for autumn sowing in Canterbury.

1471 COOPER, J. P.
Developmental analysis of populations in the cereals and herbage grasses. II. Response to low-temperature vernalization.
J. agric. Sci. 1957 : **49** : 361–83.

Using the methods described in the first paper in this series [cf. XXVI, 3138] populations of *Triticum*, *Phleum* and *Lolium* and a number of other herbage grasses from a wide range of climatic and agronomic origins have been tested in the greenhouse for their reaction to low temperature vernalization. A close correlation was found between the climatic or agronomic origin of each population and its response to low temperature but among the wheat varieties only the winter wheats from western Europe showed a response. In *Lolium* the annual strains head rapidly with little or no response while most of the perennial strains have an obligatory requirement for low temperature while in *Phleum* the rapidity of heading varies from strain to strain and shows a high correlation with persistency but little relation to temperature. The use of these tests for discriminating between populations and assessing the degree of genetical variation between and within populations is discussed.

1472 RAZUMOV, V. J.
(**Vernalization of winter cereals at temperatures below zero**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 23–34. [Russian].

Experiments are reported which show that cereal varieties which appear the same in vernalization requirements when tested at 12°–0° C. may differ when tested at − 4° C., at which temperature wheat and rye varieties from the Russian steppes were vernalized more successfully than those from European Russia or Denmark.

WHEAT

1473 MANŽELIJ, I. I.
(**Large-eared lodging resistant winter wheats**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 3 : 118–21. [Russian].

A number of wheats, including wheat-rye hybrids, originating from the German Democratic Republic were tested at Kolomna, Moscow province, and two awnless and four awned varieties selected from the wheat-rye hybrids are described. All these have ears weighing at least 3 g. and a 1000 kernel weight not below 45 g.; they are hardy and resistant to lodging under Moscow conditions. The awnless variety 29 yields 44 c. per ha. Among the new awned varieties, 21 shows resistance to *Puccinia glumarum* and *P. graminis*.

1474 DE HAAN, H.
Wheat breeding in the Netherlands.
Euphytica, Wageningen 1957 : **6** : 149–60.

This historical survey provides information on the wheats grown during the nineteenth century, the contributions made by individual breeders and by research institutes and other organizations, the varietal situation during the period 1933–1956, and procedures and statistics of seed production.

1475 LIGNON, R. & AURIAU, P.
Étude préliminaire sur les populations de blés cultivées dans le Proche-Orient. (**A preliminary study of the wheat populations cultivated in the Near East**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 19–61.

At the Lebanese-French Agricultural Station of Tell-Amara, ten types of *Triticum durum* and five types of *T. vulgare* were studied. Some lines give promising yields but on the whole the quality of the grain is low. Attempts are being made to improve the quality and to select lines adaptable to the different climatic conditions found in the Near East.

1476 GLAZUNOV, N. D.
(**Valuable varieties of spring wheat for the Altaj**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. **4** : p. 46. [Russian].

The variety Lutescens 758 is drought resistant and ripens 9–14 days before Milturum 553; it is free from lodging, shedding and sprouting in the ear and less prone to attack by rust and loose smut; being a strong wheat of high quality, it is recommended, together with Diamant [Diamond] for cultivation in the Altaj foothills.

1477 SEBÖK, C. M.
Contribuţii la problema educarii hibrizilor de grîu pe diferite agrofonduri. (**Contributions to the problem of training wheat hybrids in different agricultural environments**).
Anu. Lucr. şti., Cluj 1957 : **13** : 125–36.

The segregation of awning and yield components was studied in the F_1–F_2 of two common-wheat hybrids and one *Triticum spelta* x common wheat cross, the progenies being grown under two sets of agricultural conditions, one favourable and the other unfavourable. Some effect of environment upon the mode of segregation is reported but this was small compared with the effect of heredity.

1478 JENSEN, N. F.
The inheritance and influence of a dominant chlorophyll deficient character in wheat.
Agron. J. 1957 : **49** : 529–31.

Cornell Sel. 1015 is characterized by normal green young leaves which progressively become spotted and finally yellow. The selection involves Yorkwin, *Triticum timopheevi*, Fultz, Hungarian, Wabash, Trumbull and Hussar-Hohenheimer in its ancestry. The chlorophyll deficiency was inherited as a monofactorial and partially dominant character in a cross of Sel. 1015 with Yorkwin. Yield, height and 1000-kernel weight underwent significant reductions in segregates homozygous for the dominant gene. Overdominance probably affected the yield of the heterozygotes but its influence could not be definitely established from the data. Heterozygosity and linkage of the dominant gene with a gene or genes favourable for growth are also discussed as a possible means of interpreting the high yield of the heterozygous class compared with both classes of homozygotes and the parents. In the case of such linkage, it is suggested that although the amount of chlorophyll in the heterozygote is deficient relative to normal plants, it does not limit growth and the full effects of any linked favourable genes may therefore be expressed, whereas in the homozygous dominant such genes are impotent.

1479 STARZYCKI, S. & WĄS, L.
Wstępne badania nad hodowlą pszenicy w kierunku poprawienia jakościowych cech ziarna. (**Preliminary investigations on breeding wheat with the aim of improving grain quality**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 509–25.

Data are presented on the protein content and 1000-grain weight of interspecific hybrid lines involving *Triticum vulgare* varieties, *T. macha*, *T. compactum*, *T. turgidum* var. *cinereum*, the branched wheat *T. turgidum* var. *linnaeanum* and *T. spelta*. No correlation between 1000-grain weight and protein was found in any case. The 1000-grain weight of the hybrids was generally intermediate between or lower than those of the parents, but was frequently above the average for soft wheats cultivated in Poland. The use of branched *T. turgidum* var. *linnaeanum* as a parent tended to decrease the 1000-grain weight of the progeny. Protein content was increased in crosses with *T. spelta* and in certain combinations involving *T. turgidum* var. *cinereum*. Good results were obtained when mixed pollination was used.

All the hybrids studied proved to be hexaploid, with the exception of combinations which included *Triticale* in their parentage; these were usually tetraploid.

1480 Šulyndin, A. F. & Potapova, A. A.
(Cytological investigations of interspecific hybrids between hard spring and soft winter wheats).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 2 : 74–76. [Russian].

Hard wheats, with vernalization period of 40–50 days and hardy under Ukrainian conditions have been bred at Har'kov. They were obtained by crossing hard wheats with soft winter wheats. Most F_1 plants were characterized by a high degree of sterility and 40–60% empty grain. An exception was provided by hybrids having the soft wheat Pimenka in their parentage; these had fertile flowers and set 90–95% grain. Most of the F_2 and F_3 was normally fertile.

Abnormalities were observed in a hybrid of the soft winter wheat Alabassy with the semiwinter hard wheat Arandany. The anthers and egg cells had different numbers of chromosomes ($n = 14$–21), and chromosome lagging occurred. On pollinating the F_1 mother plants with $n = 21$ with a pollen parent with the same chromosome number, F_2 progenies of soft-wheat type were obtained having $2n = 42$. When F_1 mother plants with $n = 14$ were pollinated with a pollen parent with $n = 14$–15, F_2 progenies of the hard-wheat type were obtained.

Most F_2 and F_3 hybrids between hard and soft wheat had $n = 14$ chromosomes and meiosis was normal. The segregates of the hard winter wheat type were mostly fertile and had good grain sets. However some pollen cells had a different chromosome number from those of normal hard wheats, for instance the F_4 of Alabassy x Melanopus 69 had $n = 11$–13 chromosomes and the F_4 of Ferrugineum 1239 x Hordeiforme 1426/7 had some cells with $n = 15$–19 chromosomes.

1481 Šulyndin, A. F.
(The prospects of breeding hard winter wheats).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 3 : 37–48. [Russian].

The breeding of hard winter wheats at Odessa, L'vov, Moscow and Har'kov is discussed. General observations on the relations between hardiness on the one hand and mode of pollination, synthesis of sugars and the duration of the vernalization and light phases on the other are presented. Other topics dealt with are the evaluation of components for crosses, development of the winter habit in hybrids, training hybrids for winter habit and differences observed in acquiring winter habit between the hard and soft wheat segregates. Some F_1 of the hard winter wheats showed partial sterility, and consequently their yields were low. Fertility was fair when Pimenka, Alabassy or Lutescens 329 were the soft winter-wheat component. The fertility of hybrids also depended on the hard wheat parent, Krasavica Kabardy [Beauty of Kabarda] and Arandany giving rise to hybrids with a higher degree of fertility in crosses with the same soft wheat varieties than for instance Narodnaja [People's] or Hordeiforme 1426/7. Fertility also depended on whether the hybrids arose from direct or reciprocal crossing; in seasons with a mild winter it was higher when *T. durum* was the seed parent, but in a severe winter the reverse was the case. Productivity improved in all the F_2, F_3 and later generations, especially in the soft wheat segregates. No morphological changes occurred in the F_3 and F_4, but differences in yield were observed between plants within a family. Some productive hard winter wheats and soft wheats were selected from the F_6 of Alabassy x Narodnaja and other hybrids. While the hard wheat segregates of Odessa 3 x Melanopus 69 were useless in most respects, the soft wheat progenies from this cross were interesting for highly productive ears, large grain, a high percentage of vitreous grain and a protein content of 1·5–2%.

1482 Noronha-Wagner, M.
Secondary centric activity in an hybrid of *Triticum* and *Aegilops*.
Agron. lusit. 1956 : **18** : 251–55.

Some plants produced by twice back crossing *T. dicoccoides* x *Ae. umbellulata* to the former had two nonhomologous chromosomes of *Ae. umbellulata* in addition to the 28 chromosomes of the *Triticum* parent. Study of one of these plants revealed that the primary centromeres of the two *Aegilops* univalents sometimes failed to function, in which case the ends of the chromosomes showed a secondary centric activity.

1483 Yan [Yen], Y.-R. & Pao, W.-K.
(The significance of intergeneric hybridization between wheat and rye in breeding).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 149–56. [Chinese].

In the course of this review of Chinese research on wheat-rye hybrids, two breeding projects are mentioned: (1) intercrossing hybrids of diverse origin to improve grain setting and (2) crossing wheat-rye with standard wheat varieties and selecting in the F_3.

1484 Nakajima, G.
(Genetical and cytological studies on the breeding of amphidiploid types between wheat and rye. VIII. External characters and somatic chromosomes of $TcSF_3$ plants).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : 7 : 51–55. [Japanese].

The morphology and chromosome numbers of F_3 plants from *Triticum compactum* x *Secale cereale* are described [cf. XXV, 1852]. The progeny from F_2 plants with 47, 48, 54, 55 and 56 chromosomes had 46, 44–46, 50, 50–56 and 50–56 chromosomes respectively. The chromosomes of the later generations appear to be diverging to $2n = 42$ and $2n = 56$. Correlations were noted between chromosome number and inflorescence characteristics. Fertility was highest in the 56-chromosome offspring.

1485 Nakajima, G.
(Cytogenetical studies on F_1 plants of *Triticum persicum* x *Secale cereale*).
Senshokutai (Chromosome)/Kromosomo 1956 : Nos. 39–31 : 1043–50. [Japanese].

Three hybrids were raised, one with the expected 21 chromosomes and two with 23 chromosomes. They were intermediate morphologically, in various degrees, between the parent species. The modal meiotic configuration of the 21-chromosome hybrid is $1_{II} + 19_{I}$ and of the 23-chromosome hybrids $2_{II} + 19_{I}$. Bivalent formation appears to be usually due to autosyndesis within the AB genome. A ring-shaped bivalent or a trivalent is sometimes formed in all the hybrids. The hybrids are highly sterile but a few F_2 plants were obtained on selfing.

1486 Nakajima, G.
(Cytogenetical studies on the F_1 of *Triticum orientale* x *Secale africanum* and on the F_1 of *T. Spelta* and *S. montanum*).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 129–35. [Japanese].

Morphological and cytological descriptions are given of the above hybrids. In the first, the modal configuration is 21_{I}, in the second, 28_{I}. Up to three bivalents may be formed in the first cross and up to seven in the second. The first cross gave a 45·38% grain set; the second was sterile.

1487 Bondarenko, G. K.
(The development of acquired immunity in wheat-rye hybrids).
Priroda (Nature), Leningrad 1957 : No. 8 : 88–89. [Russian].

Some hybrids of wheat x rye were bred from parents susceptible to *Puccinia triticina* at Senel'nikovo and the resulting progenies were tested for resistance. It was found that some crosses, for instance, Odessa 3 x Har'kov 194 and Hostianum 237 x Rož' Nizkoroslaja [Short rye], gave an F_1 as susceptible to *Puccinia* as the parent forms but acquired resistance in later generations; one F_3 plant from the first cross and 26 F_3 plants from the second showed immunity. Other hybrids such as Odessa 3 x Rož' Nizkoroslaja and Lutescens 9 x Rož' Nizkoroslaja gave rise to some plants immune in the F_1 and succeeding generations. In the F_2 the percentage of immune plants was somewhat lower than in the F_1, this being accounted for by the sterility of some of the resistant types.

1488 Watanabe, Y. & Mukade, K.
(Cytogenetical studies on intergeneric hybrids between wheat and *Agropyron*. I. Chromosomal behaviour and morphology of the F_1 of *Triticum vulgare* Vill. x *Agropyron glaucum* Roem. et Schult.).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 136–46. [Japanese].

F_1 hybrids were raised from crossing *T. vulgare* 'Akakawaaka' [Red-skinned Red], 'Fultz 1', 'Hiraki' and 'Honiku 48' and a *T. timopheevi* x *Aegilops squarrosa* amphidiploid, on the one hand, with *A. glaucum* on the other. The respective modal configurations of the F_1 hybrids were (1) $1_{III} + 9_{II} + 21_{I}$, (2) $1_{III} + 7_{II} + 25_{I}$, (3) three modes, $2_{III} + 10_{II} + 16_{I}$, $1_{III} + 12_{II} + 15_{I}$ and $1_{III} + 13_{II} + 13_{I}$, (4) two modes, $2_{III} + 10_{II} + 16_{I}$ and $2_{III} + 11_{II} + 14_{I}$ and (5) $1_{III} + 8_{II} + 23_{I}$. It is inferred that all parental combinations have at least one genome in common. The F_1 plants were self sterile but progeny were obtained by crossing with *T. vulgare*. The hybrids are perennial and tiller well and are resistant to diseases, drought and cold; they are regarded as promising material for forage-grass breeding.

1489 Muramatsu, M.
(Cytological studies on the F_1 hybrid between 4*x* *Triticum aegilopoides* x *Agropyron intermedium* with special reference to the genome of *A. intermedium*).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 75–85. [Japanese].

A more detailed version is given of a paper already summarized [XXVI, 2183].

1490 **Perennial wheat is on the way.**
What's New Crops Soils 1957 : **10** : No. 1 : p. 24.

Progress made at Davis, Calif., in breeding perennial wheat from crosses between *Triticum* and *Agropyron* is briefly reviewed.

1491 Seleznev, N. N.
(Introduction of winter and spring wheat-*Agropyron* hybrids).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.) Moskva-Leningrad 1957 : No. 27 : 25–26. [Russian].

Hybrids 1, 186 and 599 outyielded the standard wheats in several provinces of RSFSR and Hybrid 1 also outyielded the standards in Estonia and Lithuania.

1492 Matsumura, S. & Fujii, T.
Radiation genetics in wheat, II. Relation between the mutation effect and the dose or wave length of X-rays in a diploid wheat.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 45–51.

[Cf. XXVI, 2197 and XXVII, 225].

1493 Sun, S.-C. & Sun, C.-C.
(A method of vegetative hybridization between wheat and *Elymus* and its efficacy).
Nung-yeh-hsueh Pao/Act. agric. sinica 1956 : **7** : 379–88. [Chinese].

The endosperm of *E. dahuricus* or *E. cylindricus* was transferred into the grains of several wheat varieties, including a branched wheat, from which the endosperm had been removed. Various modifications were noted in the resultant wheat plants, affecting in particular the size and tendency towards branching of the ears.

1494 Lysenko, O. T.
(The effect of the date of the first autumnal sowing upon changing spring into winter wheat).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 228–34.

A previous report on changing spring into winter wheat [cf. 299] is amplified to include additional observations, especially on the effect of the date of sowing in the autumn of the first year. Early autumn sowing in the first year was primarily responsible for a change from spring to winter habit in the following year and also for an increased number of winter plants with morphological changes.

1495 Didus', V. I.
(The conversion of a winter wheat which arose from fallen grains into a spring wheat).
Agrobiologija (Agrobiology) 1957 : No. 3 : 131–33. [Russian].

Fallen grains of several winter varieties such as Ukrainka, Lutescens 266 and some unidentified varieties were sown in the spring at Har'kov. It was found that some families acquired the spring habit in one year, while others were true winter wheats. No intermediate forms occurred. The percentage of spring plants varied in subsequent years depending on the variety and meteorological conditions. Some of the selected families with the spring habit were highly productive and had good baking quality. The best among them was Milturum 215 whose parental form has not been identified. It outyields the spring standard Artemovka, has better baking properties, tends to lodge less and shows resistance to bunt, smut, *Phytophaga destructor* and *Oscinella frit.*

1496 Remeslo, V. N.
(Directed changing of spring wheat as a breeding method).
Agrobiologija (Agrobiology) 1957 : No. 4 : 39–47. [Russian].

Narodnaja [People's] and some other spring wheats acquired the winter habit on being sown as winter crops for a few generations at Mironovka, Ukraine. A number of families were selected among the winter plants for high yield, hardiness, and resistance to lodging, pests and diseases. The best among them were Erythrospermum 211 and Erythrospermum 264, both originating from Narodnaja. They have large grain of good baking quality and equal or even surpass Ukrainka in protein and gluten content.

1497 Ponomarenko, F. A.
(Questions of form development in the wheats of the foot-hills and highlands of Dagestan).
Agrobiologija (Agrobiology) 1957 : No. 3 : 42–58. [Russian].

The following interspecific conversions of wheat are reported from Dagestan: *Triticum durum* → *T. vulgare*, *T. carthlicum* or *T. compactum*; *T. carthlicum* → *T. vulgare* or *T. durum*; *T. vulgare* → *T. dicoccum*; and *T. dicoccum* → *T. monococcum.* The conversions are discussed in relation to the external conditions which promoted conversion. These included sowing the seed for one or more generations at an unaccustomed date or under sharply contrasting climatic conditions, or by shattering the heritable basis of the plants by decapitation. The latter method was responsible for changes in ear colour in the first year, but decapitation carried out for more than one generation resulted in interspecific conversion.

1498 **Milns Milfast.**
Milns Seeds, Chester 1958 : p. 37.

The above winter wheat, developed from Atle x Holdfast by David Miln & Co. Ltd., Chester, England, has been released after testing in official trials in Great Britain. It has short stiff straw, high yielding capacity and good milling and baking quality.

1499 TRENTIN, A.
Sulla scelta della varietà di grano. (**On choice of a wheat variety**).
Agricoltura d. Venezie 1957 : **11** : 558–64.

The results of the trials of 1956–57, taken in conjunction with those of the two previous years, show the varieties Produttore [cf. XXVI, 3164] and Leonardo [cf. XXVI, 3162] as having given the best all-round yields in the plains of northern Italy in the three successive years, the second of the two being specially successful on soils of lower fertility. Others adapted to relatively unfavourable conditions are Funo, S. Pastore and Campodoro. Funone is frost resistant but matures late and Leone is distinguished by high tillering capacity and resistance to lodging. Certain other varieties are mentioned as suitable for highly favourable conditions or for special areas.

1500 LUK'JANENKO, P. P.
(**A new variety of winter wheat**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 3 : 113–17. [Russian].

Supplementary details of Skorospelka 3b [Early 3b], in particular of yield, rust resistance and baking quality are given [cf. XXVI, 2239]. It reaches maturity 5–7 days earlier than Novoukrainka 84 and is referred to as the earliest Soviet winter wheat and also as the first variety combining high resistance to *Puccinia triticina* with high baking quality.

1501 Rassenlijst voor landbouwgewassen 1958. (**Varietal list of agricultural plants, 1958**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : p. 57.

The winter wheats described below are being included in the Netherlands varietal list for the first time. The German variety Lang-Doerfler GB101 is red-grained and winter hardy with stiff straw and some resistance to yellow and brown rusts; it gives high yields of large grains on clay soils. The red-grained variety CB50–49 is very winter hardy with long, moderately stiff straw and gives good yields of medium-sized grain, but is susceptible to brown rust.

1502 SIKKA, S. M. & KOHLI, S. P.
Superior wheats for the Punjab hills.
Indian Fmg. 1957 : **7** : No. 5 : 6–8.

NP770 (NP4 x the Japanese variety Kononso) and NP809, both bred at the Agricultural Research Institute, Simla, and the Australian wheat Ridley have given a good performance in the above region. Highly resistant to yellow rust and loose smut, NP770 is recommended for medium to high altitudes. Suitable for lower as well as higher altitudes, NP809 possesses considerable resistance to loose smut and yellow, leaf and stem rusts.

1503 PAL, B. P.
N.P. 710—the cosmopolitan wheat.
Indian Fmg. 1957 : **7** : No. **7** : 6–7.

This variety has been described earlier [XXIV, 247].

1504 FRASER, J. G. C. & WHITESIDE, A. G. O.
Handbook of Canadian spring wheat varieties.
Publ. Dep. Agric. Canada 1956 : No. 538 : Pp. 47.

Thirty-six varieties in cultivation in Canada are described and illustrated in this handbook, with Marquis used as the standard for comparison in most cases. A brief key to the more common varieties is included and the basis of classification is discussed.

1505 **LaPorte is new Indiana wheat.**
What's New Crops Soils 1957 : **10** : No. 3 : p. 22.

The most useful feature of this medium early, soft, red, winter wheat variety is its combined resistance to loose smut and powdery mildew. It is also resistant to soil-borne mosaic and moderately resistant to leaf rust. It is beardless and white-chaffed with moderately stiff straw, taller than Dual and Seneca but shorter than Vigo. It has been released by the Purdue University Agricultural Experiment Station, Lafayette, Indiana.

1506 MORRISON, K. J.
Burt, a hard white winter wheat.
Ext. Circ. Wash. Inst. agric. Sci. 1957 : No. 284 : unpaginated.

Burt has been described earlier [XXVII, 2815]. It is a selection from the cross 27–15 x Rio-Rex.

1507 Matheson, E. M.
The quest for an Australian winter wheat.
Agric. Gaz. NSW 1957 : **68** : 506–08.

In this popular article, mention is made of Winglen, which is the first winter wheat to be bred in Australia; it produces many tillers and is suitable for grazing.

1508 Arnaudov, N.
(**An ancient naked wheat**).
Izv. bot. Inst. (Bull. bot. Inst.)/Bull. Inst. bot., Sofia 1951 : **2** : 121–40.

The identification of charred remains of wheat found in Europe, including recent finds in Bulgaria, is critically discussed. It is thought that some grains which have been identified as *Triticum compactum* may be an ancient naked wheat with small grains.

1509 Kuckuck, H. & Schiemann, E.
Über das Vorkommen von Spelz und Emmer (*Triticum Spelta* L. und *Tr. dicoccum* Schübl.) im Iran. [**On the occurrence of spelt and Emmer (*T. spelta* L. and *T. dicoccum* Schübl.) in Iran**].
Z. Pflanzenz. 1957 : **38** : 383–96.

Cultivated *T. spelta* was found in the Bakhtiari country; it resembles the European form in essential characters but produces many spikelets with three grains. Most of the plants appeared to change their vegetative habit according to the season; others were genetically-determined summer or winter types. Forms intermediate between *T. spelta* and *T. aestivum* were found. Genetical studies are in progress which may show how the European and Iranian spelts are related. *T. dicoccum* was cultivated in two localities; the two populations did not differ markedly.

1510 Oppenheimer, H. R.
Cinquante ans après la découverte du blé sauvage par A. Aaronsohn: l'importance de la découverte pour le problème de l'origine des blés cultivés. (**Fifty years after the discovery of wild wheat by A. Aaronsohn: the importance of the discovery for the problem of the origin of cultivated wheats**).
Bull. Soc. bot. Fr. 1957 : **104** : 293–97.

The author briefly reviews arguments which have been presented for and against the origin of cultivated wheats from *Triticum dicoccoides*, discovered by Aaronsohn.

1511 Gotoh [Goto], K.
Genetic analysis of varietal differentiation in cereals. V. Off-type plants observed in a wheat variety, "Saitama No. 27".
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 1–7.

This is the full version of a paper already abstracted [XXVII, 3814].

1512 Lewicki, S. & Ruszkowski, M.
Badania nad przemianą biotypów u pszenicy. Część I. (**Investigations on transforming biotypes of wheat. Part I.**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 5–21.

In experiments conducted during 1949–55 spring varieties of *Triticum vulgare* and *T. durum* were transformed into winter wheats by planting in the autumn at increasingly early periods in successive years. Natural selection for winter hardiness occurred in the populations, but after six years' treatment the varieties still grew satisfactorily when sown in spring. New mutants which preserved their characteristics in successive years also appeared as a result of autumn sowing, including forms pertaining to vars. *lutescens*, *milturum* and *ferrugineum*.

1513 Ruszkowski, M.
Badania nad przemianą biotypów u pszenicy. Część II. (**Investigations on transforming biotypes of wheat. Part II**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 23–30.

As a result of vernalization and spring sowing of the winter wheats Markowicka and Kujawianka over the period 1950–55, the two varieties were transformed into spring wheats. It is suggested that this transformation was able to take place only because the initial varieties were populations, thus allowing selection to occur. The yielding level of normal spring varieties was not attained.

1514 Riddell, J. A.
Studies on the responses of spring wheat varieties to temperature and daylength. (Parts I-IV).
Diss. Abstr. 1957 : **17** : Publ. No. 19,431 : p. 472.

A summary is given of the results of investigations on the effects of temperatures of 60°, 70° and 80° F., combined with photoperiods of 8, 12, 16 and 20 hr., upon the rate of development and node number in late-maturing spring wheats such as Chinese and Warden, in comparison with early-maturing spring varieties such as White Federation 38 and Progress.

1515 Chao, T.-F.
(The influence of stage of maturity and various post-harvest treatments on the dormancy of wheat).
Chi-wu-hsueh Pao/Act. bot. sinica 1957 : **6** : 80–90. [Chinese].

Fifteen varieties were studied; they were harvested at various stages from milk ripeness onwards and were subjected to treatments involving desiccation, high and low temperatures, and chloropicrin fumigation.

Percentage germination of white-grained varieties was higher than in red-grained varieties when the grain was harvested before full maturity. Desiccation and prechilling at 4° C. for 2 days before drying increased the germination percentage of immature grains, the response differing with the variety.

Red varieties usually had a longer dormancy period than white varieties and the red wheats with the longest dormancies were semiwinter types.

High temperature (40–47° C.) treatment for one week raised percentage germination. Storage for three weeks at 47° C. had a deleterious effect on white varieties but not on red.

Chloropicrin fumigation injured white varieties but not red.

1516 Roman, T.
Próba oceny skłonności zbóż do porastania i osypywania się ziarna ze szczególnym uwzględnieniem odmian pszenicy. **(An attempt to estimate the susceptibility of cereals to sprouting and shattering of the grain with special reference to wheat varieties).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 541–58.

The results of determinations of resistance to sprouting in the ear and shattering of 12 winter wheats in Poland are presented. The studies on sprouting were carried out at weekly intervals in a hothouse or thermostat using wheats harvested at the end of the waxy-ripe stage while shattering was studied in a specially constructed apparatus using wheat harvested at the beginning of the waxy phase and tested at 3-day intervals. Komorowska and Szelejewska were among the wheats showing greatest sprouting resistance. Awned wheats were more resistant to shedding than awnless.

1517 Sorokina, O. N. & Laptev, Ju. P.
(The amount of pollen in wheat flowers from wind pollination).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 4 : 34–40. [Russian].

Emasculated ears of the spring wheat Balaganka were bagged and at flowering time the bags were removed for varying intervals of time; later examination of the stigma and style showed that the average number of pollen grains entering the floret after 24 hr. exposures in 1954 was only 2·4 and after 45 hr. exposure 3·4; in 1955 in experiments with winter wheat the numbers were 2·0 after 2 hr., 2·9 after 25 hr. and 4·4 after 108 hr. exposures.

The seed set after 2 hr. exposure was 29·0%, after 25 hr. 42·0% and after 108 hr. 51·8%, compared with 87·8% in unbagged ears. In 1956 the proportion of florets pollinated was 41·2% after 4–2 hr. exposure, 57·5% after 8 hr., 70·6% after 28–16 hr., 63·5% after 100–48 hr. and 55·0% after 140–100 hr.; the respective sets were 31·55%, 52·80%, 29·00% and 44·40%, the set in unbagged ears being 78·53%. The hybrid grains had 100% germinating capacity and gave rise to healthy, normal seedlings but the unexpectedly small amount of pollination effected, at least under the climatic conditions of Har'kov where the experiments were carried out, is called to the attention of breeders wishing to utilize selective fertilization, supplementary pollination or similar techniques.

1518 Medvedeva, G. B.
(The modes of dominance and segregation of characters in wheat after pollination with a pollen mixture).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 217–27.

The progenies of wheat hybrids from crosses obtained by using pollen mixtures of two varieties different from the seed parent, one dominant for ear colour and the other for grain colour or ear pubescence, were analysed at Gorki Leninskie. The F_1 comprised plants with (1) the dominant character of one or the other pollinator, (2) the dominant characters of both pollinators and (3) both characters recessive. The F_2 from all the above-mentioned F_1 types exhibited the characters of both pollen parents either in the same plant or in different plants within a family.

1519 Ključareva, M. V.
(Fertilization in wheat).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 288–97. [Russian].

Observations on the wheat Ukrainka are reported from which it is concluded that after the egg cell has been fertilized several other pollen tubes discharge their contents into the embryo sac, even at a stage when the embryo has begun to divide. Others discharge their contents into the endosperm, intercellular spaces or the nucellus, where they are thought to furnish nutritive materials to the developing embryo; they contribute, it is thought, to the vitality of the developing embryo, whether they exercise any hereditary influence or not, this influence being envisaged as analogous to that occurring in vegetative hybridization.

1520 Fukasawa, H., Mito, K. & Fujiwara, M.
Preventative effect of sugars on the pollen degeneration of wheat plant.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 251–57.

When *Triticum durum* culms are cut at the time of meiosis and kept in the dark, the microspores abort. Normal pollen is produced, however, if 5% sucrose is added to the culture medium. In the case of male-sterile *T. durum* with *Aegilops ovata* cytoplasm, a slight improvement in microspore development occurs when sucrose is added but still no good pollen is formed. Paper chromatographic determinations showed that sucrose is missing from the male-sterile anthers.

1521 Lewicki, S. & Ruszkowski, M.
Wartość produkcyjna gałęzistych odmian pszenicy angielskiej. (**The production value of branched varieties of *Triticum turgidum***).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 169–81.

In comparisons with *T. vulgare* varieties carried out at the Puławy Cereal Breeding Station, Poland, branched forms of winter varieties of *T. turgidum* showed low winter hardiness and branched forms of both winter and spring varieties were low in yield and grain quality.

1522 Kojima, K.-I., Mukai, T., Suemoto, H., Sueoka, N. & Ono, H.
Studies on the right- and left-handedness of spikelets in Einkorn wheats. VI. Polygenic analysis in a species cross.
Proc. Japan Acad. 1955 : **31** : 228–33.

The inheritance of right and left handedness was studied in the F_1–F_3 and corresponding back crosses of *Triticum monococcum* var. *flavescens* x *T. aegilopoides* var. *boeticum*. The $\bar{C}$ values for the above character [cf. XXVI, 2210–1] were used as the scale of measurement and were partitioned into genetic and environmental components by Mather's method. The non-heritable component of variation was large; the number of effective factors was estimated as between 0·6 and 2·3.

1523 Uchikawa, I.
Genetic and cytological studies of speltoid wheat. VII. Further studies of compactoids with special reference to their origin.
Ehime Dagaku Kiyo/Mem. Ehime Univ. : Ser. 2 B : 1955 : **2** : 115–84.

The following types of compactoids are differentiated. Type I subcompactoids arise from β and occasionally γ het speltoids and from type III and type IV subcompactoids; they have 42 (40 + CCil) chromosomes. Type II subcompactoids arise from β and γ het speltoids and from type I and type III subcompactoids; they are trisomics with 40 + CCC chromosomes. Type III subcompactoids arise from β and γ het speltoids and from type I and type IV subcompactoids; their chromosome constitution is 40 + CCCil. Type IV subcompactoids arise from type I and type III subcompactoids and rarely from β and γ het speltoids; the chromosome complement is 40 + CCilCil. The chromosome constitutions of types I to IV of compactoids are 40 + CilCil, 40 + CCCC, 40 + CCCilCil and 40 + CCCilCil, respectively.

Type I dwarf compactoids arise from β het speltoids and type II subcompactoids; the chromosome constitution is 39 + CCC or 38 + CCCC. Type II dwarf compactoids originate from type II subcompactoids and type I het dwarf compactoids; they have 38 + CCC or 38 + CCCC chromosomes. Type III dwarf compactoids arise from type I and type III subcompactoids; the chromosome complements are 38 + CCil or 38 + CilCil.

Two subnormal types are also distinguished. Type I subnormals are of 40 + Cil constitution while type II subnormals may be heterozygous (40 + CCtl) or homozygous (40 + CtlCtl).

Extensive details are given on the meiotic behaviour and segregation ratios of the offspring of the above types. [Cf. XXII, 1769].

1524 Uchikawa, I.
Genetic and cytological studies of speltoid wheat, VIII. Further studies of speltoids with special reference to their origin.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 1–44.

From an extensive study of the mode of segregation shown by the progenies of a number of speltoid strains, the following chromosome constitutions were determined: (1) α series, normals, $2n = 40 + CC$; het speltoids, $40 + CC^{\alpha}$; homo speltoids, $40 + C^{\alpha} C^{\alpha}$; (2) β series, normals, 40

+ CC, het speltoids, 40 + C; homo speltoids, 40; (3) γ series, normals, 40 + CC; het speltoids, 40 + CCts; homo speltoids, 40 + CtsCts; modified het speltoids, 40 + CCd; and modified homo speltoids, 40 + CdCd. Full details are given of the behaviour of the chromosomes of the three speltoid strains at meiosis and on the segregation ratios in the progenies.

1525 YANG, M.-H.
(Studies on the development of wheat endosperm).
Chi-wu-hsueh Pao/Act. bot. sinica 1957 : **6** : 39–52. [Chinese].

Nuclear division in the endosperm is principally mitotic but several forms of amitosis also occur, special reference being made to amitotic budding and the formation of daughter nuclei from the ends of the arms of a cross-shaped mother nucleus. Polytriploid nuclei were noted, having presumably arisen by nuclear fusion.

Both mitotic and amitotic nuclear division were observed in the antipodal tissue.

1526 ČINOJ, D. D. [CHINOY, J. J.] & ŠARMA, Š. N. [SHARMA, S. N.]
(The development of grain in cereals. Varietal differences in the growth of wheat grains in three dimensions and the influence of external conditions).
Agrobiologija (Agrobiology) 1957 : No. **3** : 32–41. [Russian].

Measurements of the length, breadth and thickness of grain in varieties different with regard to time of flowering were carried out at Delhi. It was found that the final values for all three dimensions were varietal characteristics and apparently depended on the length of the growing period.

1527 REITZ, L. P.
Breeding wheat for quality.
Cereal Sci. today 1957 : **2** : 148–51.

A discussion is provided of problems which arise in breeding wheat to meet the requirements of both millers and farmers. Breeding for certain physical and chemical characters such as yellow grain colour, kernel hardness and high protein content is recommended.

1528 BREJ, S.
Możliwości podnoszenia wartości użytkowej pszenic w Polsce w świetle wyników oceny odmian. **(The possibility of raising the production value of wheat in Poland in the light of results of evaluation of varieties).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 563–77.

A positive relation between yield and bread volume was found for many wheat varieties grown under Polish conditions. The application of this to breeding is discussed.

1529 BOLDEA, E.
Contribuţii la studiul calitativ al grîului Arnăut de toamnă pentru fabricarea pastelor făinoase. **(Contributions to the qualitative study of the wheat Winter Albanian for making macaroni products).**
Bul. şti. Secţ. Biol. Şti. agric. 1957 : **9** : 113–26.

The above variety, a winter form of *Triticum durum*, has been described earlier [XXVI, 3181]. Studies of its flour quality are reported here. The yellow colour persists, dough expansion and strength are good and the nutritive value is high; the variety is therefore specially recommended for macaroni products.

1530 BELL, G. D. H. & BINGHAM, J.
Grain quality—a genetic and plant-breeding character. 1. Wheat.
Agric. Rev., Lond. 1957 : **3** : No. 6 : 10–22.

This discussion of the problems of breeding wheat for quality includes an account of procedures used at the Plant Breeding Institute, Cambridge, England. The following criteria are being employed in assessing wheat for particular purposes: the visually-scored characters of grain colour, smoothness of skin and vitreousness of endosperm; milling type; water absorption; dough properties in terms of extensometer measurements; and protein content of the flour. The Brabender mill has proved useful in testing single plants. Bran scores obtained for hybrid selections of both spring and winter wheat have indicated that hardness is under strong genetic control. Baking quality is being evaluated by micro-Kjeldahl nitrogen analysis and by use of the Henry Simon absorption meter and extensometer. Data from a test of F_6 hybrids and control varieties of spring wheat indicated that only weak associations existed among hardness, high water absorption and high protein content. No association was detected between the area under the extensometer curve and protein content. Extensometer behaviour in this material therefore appeared to be almost entirely determined by the nature of the protein rather than the amount. The genetic independence of the components of quality has been demonstrated by the markedly different expressions of these characters in four cultures derived from Atle x Bersée. In agreement with the generally accepted opinion, an inverse relationship has been found between flour protein content and grain yield in a limited analysis of spring-wheat hybrids. The authors discuss the possibilities of breeding for improved baking quality, taking into consideration this correlation and the high yielding capacity expected in the United Kingdom.

1531 BIRD, L. H.
Role of damaged starch in the evaluation of wheat quality.
Nature, Lond. 1957 : **180** : p. 815.

The introduction of test baking as a means of evaluating quality in wheat breeding at the Agricultural Research Institute, Wagga Wagga, NSW, has disclosed varietal differences in susceptibility to excessive damage to the starch during milling. Such damage leads to high water absorption and poor loaf volume and crumb texture, as well as stickiness in doughs containing diastatic malt. Methods previously used, viz. tests by the wheat-meal fermentation-time, farinograph and Chopin alveograph, have given a misleading indication of strength in cases of samples containing a high proportion of damaged starch.

1532 ŠEVČUK, T. N.
(The wheats of China).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. **3** : 53–57. [Russian].

A brief outline is given of the conditions of wheat cultivation in the Chinese Republic. Some 600 Chinese wheats have been added to the Leningrad collection; many of them do not exceed 60–75 cm. in height; they have a large number of ears per plant and some of them have strong straw that does not lodge. Most of them are susceptible to *Puccinia triticina* but a certain number that have shown medium resistance are enumerated.

1533 BULLEN, E. R. & LESSELLS, W. J.
The effect of nitrogen on cereal yields.
J. agric. Sci. 1957 : **49** : 319–28.

Tabulated data are included on the responses of 15 wheat varieties to nitrogen fertilization in trials at 26 centres in England between 1944 and 1948 and at 13 centres between 1949 and 1952.

1534 SCHMALZ, H.
Untersuchungen über den Einfluss von photoperiodischer Induktion und Vernalisation auf die Winterfestigkeit von Winterweizen. **(Investigations on the effect of photoperiodic induction and vernalization on the winter hardiness of winter wheat).**
Z. Pflanzenz. 1957 : **38** : 147–80.

In continuation of earlier work [XXIII, 2577], experiments were made with 30 wheat varieties grown in pots in the open during the winter and treated with artificial light in such a way that the length of day was always 12 hr. When the ear primordia in these plants were compared with controls grown in normal daylight, it was seen that the length of the primordia was increased by the treatment, the difference being greatest in those varieties in which the primordia were longest in the untreated plants; these varieties, which were the ones with upright as opposed to procumbent habit, also showed the greatest reduction in number of tillers.

In relatively mild winters where little difference in hardiness was observed in the winter wheats when grown normally, clear differences were detectable in the plants grown in 12-hr. days and these differences were accentuated if the plants had been vernalized before sowing; there was a strong negative correlation between winter hardiness and the increase in length of the ear primordia after increased photoperiod. The results were confirmed, with exceptions, by experiments with further varieties and a number of breeding lines and it is suggested that plant breeders could make use of them in testing material in relatively mild winters: differences in hardiness can generally be assessed in the plants treated with vernalization and 12-hr. photoperiods; in very mild winters the reaction of the ear promordia may be used.

1535 FAVERO, A.
"Glutinoso (S15)": una nuova varietà di grano. **[Glutinoso (S15), a new variety of wheat].**
Sementi elette 1957 : **3** : No. 6 : 57–58.

The variety described, produced at Bologna from a cross of Ardito with a hybrid of Mottin x Norin 2 [Ministry of Agriculture and Forestry 2], is a winter wheat distinguished by high cold resistance, having a long developmental phase and a short reproductive phase; its yields are lower than those of varieties such as Produttore and Mara but are more regular in areas with long, cold winters. Contents of 12–13% of dry gluten have been reported in the grain, which is very high in baking quality. The variety is classed as good or very good in respect of resistance to *Puccinia graminis*, *P. tritici*, *Fusarium nivale* (*Calonectria nivalis*), *Septoria graminum*, *Erysiphe graminis*, foot rot, drought and lodging.

1536 SANDHU, A. S.
Drought resistance in wheat and some associated morphological and physiological traits.
Diss. Abstr. 1957 : **17** : Publ. No. 17,834 : p. 211.

In investigations at the Kansas State College, wider differences in resistance to heat and drought were obtained when plants were tested in a winter-hardened condition than in active growth. Testing of winter wheat in flats was more satisfactory than testing in unglazed clay pots, since in the former more plants of a strain or more strains could be directly compared and uniformity of soil moisture could be more easily maintained. Short exposure to high temperature and longer exposure to moderately high temperature were used in variety testing. The short test allowed less time for the depletion of soil moisture and made possible the study of a greater number of plants, whereas with the longer exposure the plants were better able to adjust themselves to the new environment. Five winter wheats tested in the winter-hardened condition fell into the following descending order for resistance to both heat and drought: KanKing, Kiowa, Yogo, Sioux and Ponca. Resistance to drought was in general closely associated with heat resistance. Varieties resistant to heat and drought usually had greater dry weights of roots in proportion to top growth than susceptible wheats, from early to late stages of growth. Significant differences were found among varieties in rates of drying of excised plants, KanKing and Kiowa drying at slower rates than the others. The above five winter wheats fell into the same order with respect to water-retaining capacity as for resistance to heat and drought, except that Yogo and Sioux interchanged positions when tested at the spring-growth stage. Study of the same five wheats revealed no relationship between transpiration ratio and drought hardiness. A close association between heat resistance and winter hardiness was found among six wheats. Five spring wheats were graded into the following descending order for heat resistance: Thatcher, Selkirk, Rushmore, Lee and Baart.

1537 Kučumov, P. V. & Batulja, E. E.
(The hard wheat Hordeiforme 46).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 39–41. [Russian].

The spring wheat described arose by crossing *Triticum turgidum* x *T. dicoccum* and crossing the hybrid with *T. durum*. It has done well in a variety of areas and while withstanding high temperatures and arid conditions has given good results also under irrigation. In the Čkalov region in 1956 it yielded 21–25·5 c. per ha. compared with 14·7–21·9 c. from the standard Hordeiforme 189.

1538 Račinski, T.
(Wheat in the semimountainous districts of the Plevna province).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1957 : No. 9 : 22–23. [Bulgarian].

This report, dealing mainly with trials of older varieties, refers to the new hardy and lodging-resistant varieties Jubilejna 3 [Jubilee 3] and 30/309. Variety 301 outyielded all others in most districts; it ripens early and shows resistance to shedding, lodging and *Puccinia*.

1539 Žukovskij, P. M. & Rodionova, N. A.
(Synthesis of cultivated types of 42-chromosome wheat resistant to diseases).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 271–77. [Russian].

Brief descriptions are given of *Triticum fungicidum* ($2n = 56$, from *T. timopheevi* x *T. carthlicum*) and *Haynatricum* ($2n = 42$, from *T. dicoccum* x *Haynaldia villosa*), both characterized by resistance to mildew and rust; they have been crossed with 42-chromosome bread wheats and the hybrids back crossed and tested for resistance both under natural conditions and after spraying with natural populations of rust and mildew from the Leningrad area. Most of the first back-cross hybrids of *T. fungicidum* x *T. spaerococcum* var. *globosum* with *T. sphaerococcum* var. *globosum* were fully or partially resistant to rusts and mildew. In back crosses of *T. fungicidum* x *T. aestivum* ssp. *amplissifolium* both resistant and susceptible forms appeared; back crosses of *Haynatricum* hybrids were predominantly susceptible.

Some of the most resistant hybrids from the back crosses of *T. fungicidum* x *T. sphaerococcum* var. *globosum* when tested in various localities in the Soviet Union have remained free from attack by mildew, yellow rust and stem rust and almost free of brown rust; in time of maturity they are mostly intermediate between the parents but some selections are earlier than either parent; many of them have strong straw and do not lodge; most of the hybrids resemble *T. carthlicum* in having the face of the ear broader than the sides and an awned empty glume; their chromosome number is however $2n = 42$. The back-cross segregates from *T. fungicidum* x *T. aestivum* ssp. *amplissifolium* also have $2n = 42$ and some of them are very free from lodging.

Promising segregates have been obtained from all three crosses; they have 2–6 mature ears, from 6–12 cm. in length, with 29–72 grains per ear and 1000-grain weights of 34–54 g.; most of them are resistant to lodging and fungal infection, have a tough rachis and thresh easily.

1540 Powers, H. R. (Jun.)
Overwintering and spread of wheat powdery mildew in 1957.
Plant Dis. Reptr. 1957 : **41** : 845–47.

The usually resistant wheats Chul (CI2227) and Normandie (CI12747) were found susceptible to races of *Erysiphe graminis* var. *tritici* from Charlesville and Kearneysville respectively. Breeding for mildew resistance is discussed.

1541 Takegami, S.
(Studies on the resistance of wheat varieties to *Gibberella zeae.* I. The relations between the location within the wheat spikelet of the floret first infected by *G. zeae*, varietal differences, and withered anthers).
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1957 : No. 10 : 33–42. [Japanese].

Five Japanese varieties were classified into three groups according to whether (1) the first two florets of the spikelet were more liable to infection than the rest, (2) the first two florets were less liable to infection than the rest, or (3) the first two florets were as liable to infection as the others. There was a correlation between liability to infection of a floret and the frequency of withered anthers retained [cf. XXV, 1823].

1542 Schroeder, H. W.
Factors affecting resistance of wheat to scab caused by *Gibberella zeae* (Schw.) Petch.
Diss. Abstr. 1957 : **17** : Publ. No. 19,229 : 473–74.

Two types of heritable resistance to *G. zeae* were distinguished in a study of the scab-resistant variety Rival and susceptible Thatcher: (1) resistance to penetration, as indicated by the number of spikelets per head which became infected after spraying with a spore suspension, and (2) resistance to spread of the fungus, as measured by the number of spikelets per head which became infected after inoculation of a single spikelet on each head by a hypodermic syringe. Stage of maturity of the head at the time of inoculation also had a direct effect on penetration and subsequent spread. No evidence was obtained that resistance was associated with a growth inhibitor or morphological features. Multiple genes appeared to be responsible for the two types of resistance. In the F_1 of Thatcher x Rival, susceptibility to spread of the pathogen was dominant but susceptibility or resistance to penetration was unaffected by dominance. Although no varieties highly resistant to scab have been found in *Triticum vulgare* and other species, most commercial varieties possess some resistance. It is suggested that a combination of the two types should result in a variety with improved resistance.

1543 Nakagawa, M.
(Studies on the resistance of wheat varieties to *Gibberella saubinetii.* I. Genetical factors affecting susceptibility to *G. saubinetii*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. 3 : 142–57. [Japanese].

Further genetical studies on the seven varieties already investigated [XXVI, 1175] are reported. The number of crosses made was 22. Three loci determining resistance are still postulated but multiple alleles are now believed to be involved. The genotypes of the varieties studied are now given as: Saitama 27, aB_1C_1; Ejima 1, A_1bC_1; Wichita, ABc; Shinchunaga [New Mid-long], abC_1; Norin 26 [Ministry of Agriculture and Forestry 26]; aB_3c; Norin 50, A_3bc; and Norin 12, A_2B_2C. The most resistant genotype is believed to be *abc* and attempts are being made to isolate this combination from appropriate crossings between the above varieties.

1544 Nakagawa, M.
(Studies on the resistance of wheat varieties to *Gibberella saubinetii.* II. The relation between percentage of diseased spikes, percentage of diseased spikelets and percentage of diseased grains in relation to infestation by *G. saubinetii*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. 3 : 158–70. [Japanese].

This paper is a slightly expanded version of one already summarized [XXVI, 2231].

1545 Nakagawa, M.
(Studies on the resistance of wheat varieties to *Gibberella saubinetii.* III. Alcohol fermentation by *G. saubinetii*).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. 3 : 171–74. [Japanese].

This article has been already summarized from another source [XXVI, 2232].

1546 Gottlieb, D.
Take-all of wheat in Chile.
Plant Prot. Bull. 1957 : **6** : 20–21.

Six wheats and two wheat x *Agropyron* hybrids were found to be highly resistant to *Ophiobolus graminis*, in a preliminary trial of 358 varieties held in Chile. Some resistant grasses are also listed.

1547 Chaudhry, A. R. & Abdul Hafiz
Effect of bunt on certain morphological characters of the wheat plant.
Agriculture, Pakistan 1956 : **7** : 292–301.

The effect of infection by *Tilletia tritici* has been studied at Kullu and Lyallpur using 53 varieties. Differences between infected varieties were observed in respect of length of ears, length and size of awns, grain weight, weight and hardness of bunt balls and percentage germination of chlamydospores from the bunt balls.

1548 Wagner, F.
Ergebnisse vergleichender Weizensortenprüfungen auf Widerstandsfähigkeit gegen Stein- und Zwergbrand. (**Results of comparative tests of wheat varieties for resistance to bunt and dwarf bunt**).
Bayer. landw. Jb. 1957 : Sonderheft 2 : 15–17.

Fifteen German and three American varieties were tested in Munich and Bayreuth with spores of *Tilletia tritici* and *T. controversa* of various origin. Relief and Wasatch were completely resistant to both pathogens; no physiological races of *T. controversa* were found.

1549 Volosky de Hernández, D.
Estudio sobre el comportamiento de los cruzamientos de trigo a la "carie del trigo". (**Study on the behaviour of wheat crosses to wheat bunt**).
Agricultura téc., Santiago 1955 : **15** : 12–14.

Data are presented on the reaction of 578 lines from different wheat crosses tested with *Tilletia tritici* and *T. laevis* in 1952 and 1953. Resistant lines were found in the crosses Kenya x Santa Catalina x Corazón, Thatcher x Santa Catalina and Hope x Thatcher. The varieties Gigante Inglés [English Giant], Mercury, Pilot I–B–2687 and Poland were also resistant.

1550 Dewey, W. G.
Genetic and pathological studies with dwarf bunt of winter wheat.
Diss. Abstr. 1957 : **17** : Publ. No. 20,016 : p. 8.

Race T–16 of *Tilletia caries* and a composite of races of *T. foetida* were found to be reliable as substitutes for testing reaction to *T. brevifaciens*. Using T–16, the dwarf-bunt resistance of a selection from the Pacific Northwest proved to be dominant in crosses with several susceptible wheats from the north-east of the USA. Some of the data could be explained by an hypothesis of duplicate factors but inheritance of resistance is probably more complex. Awn type and chaff colour were not linked with reaction to dwarf bunt or leaf rust.

1551 Holton, C. S. & Kendrick, E. L.
Fusion between secondary sporidia in culture is a valid index of sex compatibility in *Tilletia caries*.
Phytopathology 1957 : **47** : 688–89.

Evidence in favour of the above statement has been obtained from inoculation studies. All pairs of monosporidial lines in which there was fusion between secondary sporidia in culture also produced infection on the host but infection is affected by type of growth in culture and method of inoculation [cf. XXIV, 121].

1552 Kendrick, E. L.
The production of teliospores of *Tilletia caries* in culture.
Phytopathology 1957 : **47** : 674–76.

Two of the monosporidial lines isolated from crosses made between compatible pigmented and nonpigmented lines of *T. caries* gave rise in culture to a mass of black spores which germinated like teliospores. It is suggested that these two lines were dicaryotic and also capable of completing the life cycle of the species in culture and that their behaviour indicates the operation of a genetic pattern unusual for this species.

1553 Zscheile, F. P. & Murray, H. C.
Chromatographic study of amino acid development in wheat ovules in relation to genes for disease resistance.
Phytopathology 1957 : **47** : 631–32.

A study has been carried out of the aminoacid contents of the ovules of 10 pairs of wheat varieties, and one group of three varieties, isogenic except for the Martin gene for resistance to *Tilletia caries*. Appreciable differences between resistant and susceptible varieties were found in respect of the average contents of ethanolamine, lysine and leucine in the ovules at anthesis and of tyrosine after anthesis. Tabulated data on the abundance of a total of 17 aminoacids in the ovules of 23 varieties is included but the influence of the presence of the resistance genes on the aminoacid content of the ovules is not sufficiently great to indicate that resistance or susceptibility to bunt is related to this particular characteristic.

1554 Bedi, K. S.
Fighting the flag smut.
Indian Fmg. 1957 : 7 : No. 6 : p. 25.

The beardless Pusa wheat IP165 is recommended as being highly resistant to flag smut.

1555 Zadoks, J. C.
Comments on rust from the "IV° International Congress of Crop Protection" held at Hamburg, Germany, 8-15th September, 1957.
Robigo, Castelar 1957 : No. 4 : 16–20; also in Spanish. (Mimeographed).

Stakman reviewed some of the work which has been done in breeding for rust resistance. The relation of leaf-rust reaction in wheat to the carbohydrate, protein and polyphenol content of the leaf was mentioned. Fedotova reported that, in breeding for leaf rust resistance in wheat, it is best to use the resistant form as the female parent. Transplanting embryos into genetically different forms has also produced resistant types. It was emphasized that environmental conditions present during early development influence rust resistance in wheat.

1556 Olien, C. R.
Studies on necrosis in the infection of Khapli emmer by the stem rust fungus, *Puccinia graminis* var. *tritici*.
Diss. Abstr. 1957 : **17** : Publ. No. 21,254 : p. 1171.

The results obtained from various electrical treatments of tissues of Khapli emmer infected with stem-rust race 56 indicated that a negatively-charged substance was associated with necrosis.

1557 Freitas, A. P. C. e
Looking for resistance to "leaf rust" of wheat in Portugal.
Robigo, Castelar 1957 : No. 4 : 8–9; also in Spanish. (Mimeographed).

Some lines of *Triticum aestivum* and *T. durum* resistant to *Puccinia rubigo-vera* var. *tritici* are listed.

1558 Green, G. J. & Kerber, E. R.
Pathogenicity of certain isolates of wheat stem rust to durum wheat varieties.
Plant Dis. Reptr. 1957 : **41** : 848–52.

In glasshouse trials at Winnipeg, the seedling reaction of 28 durum wheats to races of *Puccinia graminis* var. *tritici* was determined. Langdon and Yuma were found susceptible to isolates of races 15 and 15B–1; an isolate of 15B–4 attacked Ramsey and Towner. These isolates and six other races had no effect on St464 and six CI varieties.

1559 Johnston, C. O.
Physiologic races of *Puccinia rubigo-vera* f. sp. *tritici* in the United States in 1956.
Plant Dis. Reptr. 1957 : **41** : 853–55.

Race 122 has displaced race 5 as the most abundant; 23 races were isolated.

1560 Caldwell, R. M., Schafer, J. F. & Compton, L. E. & Patterson, F. J.
A mature-plant type of wheat leaf rust resistance of composite origin.
Phytopathology 1957 : **47** : 690–91.

The resistance of Dual [cf. XXVI, 1170] to *Puccinia recondita* f. sp. *tritici* is derived from four of its ancestors, namely Fultz Selection, Wabash, Hope and Hussar, although the type of resistance shown by the first two is believed to be the same. Dual has shown a high level of field resistance and the advantages of combining several sources of resistance in this way are discussed.

1561 Hassebrauk, K.
Die physiologische Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss.) in Deutschland und einigen anderen westeuropäischen Staaten im Jahre 1956. [**The physiological specialization of brown wheat rust (*P. triticina* Erikss.) in Germany and some other west European states in the year 1956**].
NachrBl. dtsch. PflSchDienst., Stuttgart 1957 : **9** : 182–83.

Race 17 was present in 82% of the 189 samples from 99 localities and race 52 was present in 51%. Twelve other races were also identified.

1562 Volosky de Hernandez, D.
Determination of a race of *Puccinia graminis tritici* in England.
Robigo, Castelar 1957 : No. 4 : p. 5; also in Spanish. (Mimeographed).

The physiological race 176 was found on some wheat at the National Institute of Agricultural Botany, Cambridge, England.

1563 Freitas, A. P. C. e
***Puccinia rubigo-vera tritici* in Portugal (variation of number of physiologic races present each year).**
Robigo, Castelar 1957 : No. 4 : 5–7; also in Spanish. (Mimeographed).

The comparative frequency of the races of *P. rubigo-vera* var. *tritici* occurring in Portugal during 1948–55 is recorded in a diagram. Race 11 has been most frequent in the last five years.

1564 Gallwey, B. M. G.
The identification of races of *Puccinia graminis* in South Africa.
Robigo, Castelar 1957 : No. 4 : p. 15; also in Spanish. (Mimeographed).

Five races designated KS/1, KS/2, KS/3, KS/4 and KS/5 were found on wheat; these resemble the Stakman races 11, 15, 16, 21 and 34 respectively. Race KS/5 occurred in 91% of the samples collected during 1954–56.

1565 Vallega, J. & Cenoz, H. P.
Características patógenas de la raza 15 de *Puccinia graminis tritici* de Ecuador. (**Pathogenic characteristics of race 15 of *P. graminis tritici* from Ecuador**).
Rev. Invest. agríc. B. Aires 1957 : **11** : 145–47.

An Ecuadorian line of race 15B of the above pathogen resembles the Peruvian line 15B4P in being able to attack the wheat Mentana and some of its descendants, including Magnif 27 (= Magnif MG). Its reaction type on 13 differentials is recorded but until data from further varieties are obtained it is proposed not to number the new line but to call it race 15B.Ec.

1566 Boasso, C.
Physiologic races of some of the cereal rusts isolated in Uruguay in 1956.
Robigo, Castelar 1957 : No. 4 : 11–12; also in Spanish. (Mimeographed).

The following rusts were found: races 11, 15B and 17 of *Puccinia graminis* var. *tritici*, race 14 of *P. hordei* and race 4 of *P. graminis* var. *avenae*.

1567 Knott, D. R.
The inheritance of rust resistance. III. The inheritance of stem rust resistance in nine Kenya varieties of common wheat.
Canad. J. Pl. Sci. 1957 : **37** : 366–84.

Inheritance of resistance to races 15B and 56 has been investigated in Kenya 58, Kenya 117A, Kenya C9906, Kenya 338.AC.2.E.2, Kenya Governor, Kenya B286, Kenya 291.J.1.I.1, Kenya 321.BT.1.B.1 and Kenya 350.AD.9.C.2. For the sake of convenience the pedigree part of the variety designations is omitted below. Diallel crosses were made among Thatcher, Marquis and the nine Kenya wheats, except for the 15 crosses analysed previously [XXVII, 439 and XXVIII, 337]. Crosses of Marquis with varieties not used in the earlier work were also back crossed to Marquis; these varieties were Kenya B286, Kenya 291, Kenya 321 and Kenya 350. All nine Kenya varieties carry *Sr*7 for resistance to race 15B. Kenya 58, Kenya C9906, Kenya 291 and Kenya 350 contain *Sr*6, which conditions a hypersensitive reaction to both races 15B and 56. The data suggested that in addition Kenya 117A, Kenya 338, Kenya B286 and Kenya 321 possess *Sr*9 and Kenya 117A, Kenya 238, Kenya 291, Kenya 321 and Kenya 350 *Sr*10. These two genes confer moderate resistance to race 56. Kenya 338 also carries two dominant complementary genes, *Sr*11 and *Sr*12, which determine resistance to race 56. *Sr*9, *Sr*10, *Sr*11 and *Sr*12 are important modifiers of resistance to 15B as conditioned by *Sr*7, *Sr*9 probably being the most effective.

1568 Fitzgerald, P. J., Caldwell, R. M. & Nelson, O. E. (Jun.)
Inheritance of resistance to certain races of leaf rust of wheat.
Agron. J. 1957 : **49** : 539–43.

The resistance of Purdue Sel. 3369–61–1–1–10 to races 9, 15 and 76 is controlled by single dominant genes, respectively designated *Lr*4, *Lr*5 and *Lr*6. *Lr*4 is independant of *Lr*5 and *Lr*6 which are linked with a cross-over value of 5·5%. The resistance of this selection to race 5 also depends upon a single dominant gene (no symbol given), while its resistance to race 65 is conditioned by duplicate recessive genes, *lr*7 and *lr*8, which are inherited independently of each other and of the gene for resistance to race 5. *Lr*6 is independent of *Lr*1 controlling resistance to race 76 in Malakof. Data from the cross with Wabash suggested that Sel. 3369–61–1–1–10 also contains a dominant gene for susceptibility to race 9, which is closely linked with and hypostatic to *Lr*4, whereas Wabash carries recessive genes at the corresponding loci, with the recessive gene for resistance epistatic to that for susceptibility. The distance between the two loci was estimated as approximately 2·0 cross-over units.

1569 Király, Z. & Farkas, G.
A beteg növény enzimológiája és az ellenállóképesség. (**Enzymology of the diseased plant and resistance**).
KisérlÜgy. Közl. 1956 : **50** : 149–64.

Increased respiration and ascorbic acid oxidase activity were observed in wheat seedlings upon infection with mildew or black rust. Among uninfected plants, resistant seedlings of *Triticum timopheevi* and *T. monococcum* had an appreciably higher respiration rate than the susceptible Hungarian wheats F481 and Bánkút 1201.

1570 Kohli, S. P. & Mitra, A. K.
Two new wheats for the Uttar Pradesh hills.
Indian Fmg. 1957 : **7** : No. 6 : 20–22.

NP770 (NP4 x Kononso) and Ridley have given high yields in different regions of Uttar Pradesh; the former is recommended for cultivation in districts at 4000 ft. and above, where yellow rust and loose smut are the only serious diseases. Ridley is considered suitable for lower districts; it is highly resistant to all rusts and loose smut.

1571 Bruehl, G. W.
Cephalosporium stripe disease of wheat.
Phytopathology 1957 : **47** : 641–49.

Data are included showing the reaction of a number of winter wheat varieties to inoculation with *C. gramineum* at Washington State College, Pullman, Wash.

1572 Bonfiglioli, O.
Prove con razze di frumento italiane in Jugoslavia. (**Tests with Italian varieties of wheat in Yugoslavia**).
Sementi elette 1957 : **3** : No. 6 : 6–14.

Trials of a number of Italian and other wheats in Yugoslavia showed the most frost resistant to be Elia, Fiorello, Vivenza, S. Marino, Clavatino, Autonomia, Produttore, S. Pastore and Abbondanza. The greatest vernalization requirements were found in Elia, S. Pastore, Virgilio, Salto and Aquila. Tabular data are given showing the yields of the varieties in different parts of the country. Funo and S. Pastore were the most resistant to *Septoria tritici*; Produttore proved almost immune from *S.* (*Leptosphaeria*) *nodorum* and resistant to *Fusarium* spp., other varieties resistant to *Fusarium* spp. being R16, Quaderna, the Greek wheats and some local selections; Funo, Generoso and Fortunato were the least attacked by rust.

1573 Forsøg med vårhvede. (**Trials of spring wheat**).
Tidsskr. Planteavl 1957 : **61** : 549–50.

Information on the performance of five varieties tested in Denmark during 1950–55 is presented.

1574 Šulyndin, A. E. & Poltarev, E. M.
(**The inheritance and formation of the vernalization phase in interspecific hybrids of wheat**).
Agrobiologija (Agrobiology) 1957 : No. 4 : 48–58. [Russian].

An extended account of a report already summarized is given [XXVII, 1645].

1575 Yamasaki, M. & Hanada, K.
(**On changes in resistance to potassium chlorate and content of reducing substances during the process of vernalization in wheat**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 199–202. [Japanese].

Six varieties were vernalized for 0–60 days. Resistance to the toxic action of $KClO_3$ increased with the length of the vernalization period, the increase being considerably greater in winter varieties. The high negative correlation between winter habit and resistance to $KClO_3$ in unvernalized wheats practically disappears after vernalization. Data are provided on the reducing-sugar, sucrose and ascorbic acid contents of the varieties during vernalization.

1576 Morrison, J. W.
Dwarfs, semi-lethals and lethals in wheat.
Euphytica, Wageningen 1957 : **6** : 213–23.

The author reviews the literature on the genetics of the dwarfed, semilethal and lethal conditions which have arisen spontaneously in intergeneric, interspecific and intraspecific crosses. Cytological investigations on dwarfs also receive attention. The main conclusions and suppositions which may be reached from the information so far available are indicated and problems requiring elucidation are defined.

BUCKWHEAT

1577 Krotov, A. S.
(**Introduce hybrid seed of buckwheat into production**).
Zemledelie (Agriculture) 1957 : No. 5 : 92–93. [Russian].

Heterotic seed was obtained at various Soviet institutes by sowing mechanical seed mixtures of two varieties in which one component was Bogatyr' [Hero] and the other a local variety. Some local varieties suitable for production of heterotic seed are listed.

1578 Gorina, E. D.
(**Efficacy of sowing varietal mixtures of buckwheat**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 50–52. [Russian].

Paired sowings of eight different combinations of varieties, sown in equal parts, were compared with the pure varieties. Some of the combinations showed improvements in yield even in the year of sowing, differences of up to 11·8% being observed. In the first seed generation the best pair, Terehov x Bogatyr' [Hero], showed a yield increase of 26% over the one parent and 18% over the other. On the other hand mixtures of two local varieties, of similar type, gave increases of only 3 and 4%; nor was any marked increase produced from mixtures of varieties differing too widely in time of ripening. The progeny of Terehov x Bogatyr' were uniform in type and in flowering and maturity, in spite of the fact that the former has a vegetation period of 67 days and the latter 73 days and the varieties differ also in height and certain other features. A further yield increase occurred in the second generation, which was 30·9% higher than the control; the third was 19·4% and the fourth 11·9% above the control.

OATS

1579 ZELENSKIJ, S. S.
(The oat L'gov 1026).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 41–44. [Russian].

The variety described was produced by crossing Pobeda [Victory] with a hybrid of *Avena byzantina* x Gigant [Giant]. In the eight-year period 1948–55 its average yield at L'gov was 37·5 c. per ha., compared with 33·8 c. for Victory and 34·2 c. for Sovetskij; it is resistant to crown rust, more drought resistant than Victory and suitable for mechanized agriculture; in other parts of the Ukraine it has exceeded Victory by as much as 6·8 c. per ha. and Sovetskij by up to 9·2 c.

1580 MARKITANTOVA, A. V.
(Vegetative hybrids of cereals).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 64–65. [Russian].

Several lines in the first and second seed generations of a Scottish oat grafted on to a White Russian oat had larger grains than the original varieties and somewhat higher grain yields. From grafts of Orel [Eagle] on to the endosperm of Lea a line was obtained in the third generation which gave yields of 93·5 c. per ha. compared with 35·6 c. from Orel; in the fourth generation the yields were 17·1 c. and 14·2 c. respectively. Improvements have also been effected by grafting the embryo of one plant on to the endosperm of another plant of the same variety.

1581 **Black light helps seed oats testing.**
What's New Crops Soils 1957 : **10** : No. 2 : p. 23.

It has been found at Cornell University, NY, that oat varieties may be distinguished by their luminescence under ultraviolet light and that off-type seed may be separated by this technique.

1582 **(The oat Serebristyj).**
Nauk. pered. Opyt sel'sk. Hozjajstv. 1957 : No. 10 : p. 65. [Russian].

Serebristyj [Silver] was bred at Kossovo, White Russia. It is resistant to lodging and has large grain, a low husk content and outyields the standard Soviet by 4–8 c. per ha.

1583 WELSH, J. N.
Garry and Rodney oats.
Agric. Inst. Rev. 1957 : **12** : No. 4 : 13–15.

Information is given on the breeding and performance of Garry and Rodney oats [cf. XXVI, 2260 and XXV, 1711 respectively]. Garry came from the cross Victory x RL1272 (Victoria x RL524) and Rodney from RL1574 x Roxton. Some problems associated with oat breeding, such as producing varieties resistant to prevalent rust races, are discussed.

1584 SAMPSON, D. R.
On the origin of oats.
Bot. Mus. Leafl. Harv. 1954 : **16** : 265–303.

A survey of the classification, distribution, cytology, genetics and archeological occurrence of oats is presented. Among the diploid species, most have a limited distribution in the Mediterranean region and speciation appears to have involved structural changes in the chromosomes. The lack of floret articulation in the cultivated diploid species investigated is controlled by two recessive genes. The tetraploids have a similar range but are better represented in the Near East; they carry two partially homologous genomes which are also homologous with those of the diploids studied and have similar factors controlling floret articulation. The origin of the cultivated diploids and tetraploids is envisaged as the result of mutation in wild forms followed by geographical isolation.

The origin of the hexaploids is unclear. *Avena fatua* and *A. sativa* have a wide range while the others are largely restricted to the Mediterranean and Near East.

The hexaploids appear to contain at least one diploid genome but homology between the genomes of tetraploids and hexaploids is very low. The cultivated hexaploids carry dominant *B* or *C* factors suppressing the expression of the fatuoid type of floret articulation.

1585 Skrabka, H.
Określenie różnic w sile ssącej kiełkującego ziarna odmian owsa. (**Different determinations of the force of imbibition of germinating grains of oat varieties**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 85–102.

In 10 oat varieties grown in 11 localities in Poland, intervarietal differences in the imbibition force of the germinating grain, as determined by germination experiments in dry soils and in sugar solutions of various concentrations, were greater than environmental differences. Early varieties showed a higher imbibition force than late varieties.

1586 Ruszkowski, M.
Studia nad owsem nagim (*Avena nuda*). [**Studies on naked oats (*A. nuda*)**].
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 61–74.

Naked oat strains developed in Poland since 1947 have equalled hulled varieties in grain yield, have proved superior in content of digestible protein and carbohydrate and in addition have stiff straw, early maturity, resistance to shattering and moderate rust resistance.

1587 Kent, N. L.
The quality of oats in North-East Scotland trials, 1952-1955.
Scot. Agric. 1957 : **37** : 98–102.

Some of the varieties included in the trials carried out in Aberdeenshire [cf. XXVII, 1649] were analysed for percentage kernel content, 1000-kernel weight, kernel yield, and the oil and protein contents of the kernels. Victory and those varieties related to Victory, viz. Blenda, Ayr Commando, Reagle and the control Sun II were all of excellent milling quality. Forward, Onward and Aa724, all related to Marvellous, and Ayr Ally and Craigs Afterlea, both derived from Potato types by hybridization, were inferior in milling quality.

1588 Kozera, G.
Badania nad przydatnością ziarna różnych odmian owsa dla przemysłu płatkarskiego. (**Investigations on the suitability of the grain of different oat varieties for industrial milling**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 75–84.

In trials of six local naked varieties in Poland, yellow varieties gave higher yields and were better in quality than white. It is suggested that spoilage in milled oats results from a high content of fatty acids and low content of reducing agents in the fat leading to a tendency to rancidity. Since high positive correlations were obtained in the above varieties between percentage fat and iodine value and between percentage fat and percentage tocopherol, it is concluded that breeding for higher fat content will not result in an increase in rancidity.

1589 Thurston, J. M.
Morphological and physiological variation in wild oats (*Avena fatua* L. and *A. ludoviciana* Dur.) and in hybrids between wild and cultivated oats.
J. agric. Sci. 1957 : **49** : 259–74.

Tabulated data are provided showing the range of variation in a number of morphological and physiological characters in *Avena ludoviciana* and *A. fatua*. Evidence is presented and discussed that some of the intermediate types observed may be hybrids between the two above species and *A. sativa*. The chromosome number of *A. ludoviciana* and *A. fatua* was found to be $2n = 42$ and all but one of the selections studied showed normal meiotic behaviour.

1590 Borkovskaja, V. A.
(**The prospects of growing winter oats in the North Caucasus**).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : 32–35. [Russian].

In the Kabardino-Balkarian ASSR the winter oat Karbardinec [oat from Kabarda] matures considerably earlier than spring oats and escapes attack by frit fly, its yield of grain being 2–2·5 times that of the spring oats. Observations were made in 1953 on eight other varieties that had survived the severe winter of 1949–50; all of them exceeded the standard spring oat Sovetskij in grain yield; most were more subject to lodging but 9885 from England, though inferior to the others in earliness and in drought and cold resistance, stood well and consequently outyielded the rest in years of heavy lodging. The most winter hardy were 4065 from the Crimea and 7994 from the USA. Good yields of grain were obtained from the winter oats after they had been mown once for hay.

1591 Luke, H. H., Chapman, W. H. & Wallace, A. T.
Reaction of oats to powdery mildew.
Plant Dis. Reptr. 1957 : **41** : 842–44.

The reaction to *Erysiphe graminis* var. *avenae* was determined for 250 varieties and selections growing in Florida. It was found that Red Rustproof types and selections and crosses involving Victorgrain were highly resistant to powdery mildew. Selections from crosses which had Clinton^2-Santa Fe as one parent were susceptible.

1592 HOOKER, A. L.
Varietal reaction correlation studies in the *Septoria* disease of oats.
Agron. J. 1957 : **49** : 600–04.

Significant differences in reaction to *S. avenae* (*Leptosphaeria avenaria*) are reported for a large number of oat varieties grown at several stations in Wisconsin. Positive correlations were found in: (1) varietal reaction in different localities and in different phases of the disease and (2) varietal reaction in different localities and in different years. The date of heading and disease reaction were negatively associated.

1593 MOULE, C.
La résistance au charbon nu chez l'avoine cultivée. (**Resistance to loose smut in cultivated oats**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 159–98.

Methods of studying and measuring varietal resistance to loose smut and the inheritance of smut resistance are discussed. The reaction to smut of many important varieties was studied at the Plant Breeding Station of Versailles during 1949–56; the results are tabulated. Lines from the variety Markton have been produced which combine high resistance with other desirable agronomic characters; Garry is also being used as a source of resistance. According to the resistance shown by the plant, the growth of the smut mycelium appears to be arrested at one of five stages of development.

1594 PETURSON, B.
Physiological races of crown rust in Canada 1929 to 1956.
Proc. Canad. phytopath. Soc. 1957 : No. 25 : p. 16. (Abst.).

Races 239 and 240 of *Puccinia coronata* var. *avenae*, which are nonpathogenic to the oat variety Bond, were the most prevalent races in Eastern Canada. They were also common in western Canada, but races 201, 202 and 202A, which are pathogenic to Bond, were predominant. In 1956, races 263 and 276 occurred; these are pathogenic to all oat varieties being used in breeding for crown-rust resistance in Canada.

1595 CENÓZ, H. P. & VALLEGA, J.
Chances that have had the differential varieties of *Puccinia coronata avenae* of being attacked by the crown rust in Argentina, in 1956.
Robigo, Castelar 1957 : No. 4 : 13–14; also in Spanish. (Mimeographed).

Races of *Puccinia coronata* var. *avenae* occurring in Argentina during 1956 are listed; the liability to attack of eleven differential varieties is set out.

1596 GRIFFITHS, D. J., HOLDEN, J. H. W. & JONES, J. M.
Investigations on resistance of oats to stem eelworm, *Ditylenchus dipsaci* Kühn.
Ann. appl. Biol. 1957 : **45** : 709–20.

The procedure used by the Welsh Plant Breeding Station, Aberystwyth, for testing varietal reaction to *D. dipsaci* is described; seed is sown in land naturally and heavily infested with eelworms. In a study of 250 types, it was found that resistant forms of *Avena sativa* originated from Grey Winter or similar winter hardy types; resistant forms of *A. byzantina* and *A. ludoviciana* also occur. The inheritance of resistance appeared to depend on a single dominant gene in crosses involving Grey Winter and susceptible types; there is some evidence for the existence of additional genes modifying the reaction.

RYE

1597 ŠESTAKOV, V. E. & ORLOV, V. A.
(**Methods of obtaining hybrid rye seed and studying its productiveness**).
Agrobiologija (Agrobiology) 1957 : No. 2 : 40–43. [Russian].

The yields of such varieties as Lisicyna [Lisicyn's], Saratov 1, Volžanka [rye from the Volga Basin] and Kazan' were improved by intervarietal pollination at the Petrovsk breeding station. The hybrid seed of Lisicyna was obtained by growing this variety between the rows of Saratov 1. The hybrid progeny outyielded the élites of Lisicyna on the average for four years by 2·5 c. per ha., showed improved hardiness and produced larger grain. Another unspecified variety was also used for pollination of Volžanka, Saratov 1 and Kazan' and in each case the hybrid seed is said to have given yield increases as compared with the pure varietal seeds. In Saratov 1 the yield increase amounted to 4·2 c. per ha.

1598 Wolski, T.
Zastosowanie heterozji w hodowli żyta. **(The application of heterosis in breeding rye).**
Postępy Nauk Roln. 1956 : No. 2 : 63–72.

After a general discussion of the problems of breeding heterotic rye, the method used in Poland in producing Dańkowskie Selekcyjne [Dańkow Selection] is described. Two populations derived from one stock were reared for three generations in different localities under widely different conditions of soil and climate. On mixing the two populations, an F_1 was produced which, in both localities, outyielded the higher yielding of the two components in both grain and straw. The F_1 data presented for 1955 show an average increase in grain yield of 4·14 q./ha. or 12·7% over the mean of the unmixed populations.

1599 Stutz, H. C.
A cytogenetic analysis of the hybrid *Secale cereale* L. x *Secale montanum* Guss. and its progeny.
Genetics 1957 : **42** : 199–221.

A translocation configuration involving six chromosomes was observed in pollen mother cells of the hybrids *S. cereale* x *S. montanum* and *S. cereale* x *S. africanum*, while only bivalents were found in *S. montanum* x *S. africanum*. A high frequency of trisomics was observed in the F_2 of *S. cereale* x *S. montanum* and in most cases the extra chromosome belonged to the translocation group. The bearing of this work on the evolution of the genus is discussed and it is concluded that *S. cereale* was derived from weed rye types which in turn developed from hybridization between *S. sylvestre* and *S. montanum*. The extreme variability shown by rye and weed rye populations is considered to have resulted from introgression by *S. montanum*. Extra chromosomes in rye populations are also considered to have resulted from interspecific hybridization.

1600 Svalöfs Värneråg överträffar Petkusrågen. **(The Svalöf rye Värne exceeds Petkus rye).**
Allmänna Svenska Utsädesaktiebolaget, Svalöf (General Swedish Seed Co. Ltd., Svalöf) 1958 : 28–29.

Värne [cf. XXVI, 2269] has outyielded Petkus II in Swedish trials over the period 1950–55 and appears to be the highest yielding current variety.

1601 Bose, S.
Aberrations in the nucleolar chromosome of inbred rye. II. Size variation in inbred lines and population plants.
Hereditas, Lund 1957 : **43** : 621–43.

Seven inbred lines derived from the stock of Stålråg [Steel rye] used for previous investigations [cf. XXVII, 1679] were classified into three groups on the basis of the ratio of the length of the long arm of the nucleolar chromosome to the length of the short arm (minus the satellite). In the first group (lines 47, 84 and 76) the ratio exceeded 2·4 while in the second (lines 39 and 98) the ratio was less than 2·0. The third group (lines 71 and 63) had ratios intermediate between those in the other two. The differences in the ratios were due to variations in the lengths of the arms, chiefly the short arms. The satellites also varied in length, the variation in length of arms and satellites being due to differences in the size of the knobs present in definite regions. These knobs are regarded as being the result of the addition of extra material. An analysis of 50 plants representing a single population revealed the presence of similar types of aberrations in either one or both of the homologous chromosomes. Of the 19 plants found to be homomorphic, 10 had short arms and large satellites. Twenty-four plants were heteromorphic; the remainder could not be classified with certainty. It is suggested that much of the variation in the nucleolar chromosome in the inbred lines was derived from the original stock.

1602 Müntzing, A.
Frequency of accessory chromosomes in rye strains from Iran and Korea.
Hereditas, Lund 1957 : **43** : 682–85.

From an examination of 80 populations, it was concluded that about two-thirds of the populations in Iran contain plants with accessories. The frequency of plants with accessories in a population was however fairly low in most cases (less than 10%). No correlation was detected between frequency of plants with accessories and geographical distribution. The number of accessories per plant was usually 2, plants with 1, 3 or 4 accessories being exceptional. The preponderance of an even number of accessories is ascribed to the effect of nondisjunction [XXVI, 22]. Among the seven Korean strains investigated, the percentage of plants with accessories ranged from 19·4 in Seoul 2 to 89·5 in Yonkii and 9·15 in Booyou. The predominant numbers of accessories per plant were 2 and 4. All the accessories in the Iran populations were of the standard type. Those of the Korean strains were usually of this type also but in a few plants structurally deviating types were observed. Since the presence of accessories appears to be a primitive trait, study of such chromosomes may be of importance in connexion with the problem of the centre or centres of origin of cultivated rye.

1603 HÅKANSSON, A.
Meiosis and pollen mitosis in rye plants with many accessory chromosomes.
Hereditas, Lund 1957 : **43** : 603–20.

Pollen meiosis was studied chiefly in plants of Wasa II with eight accessories. These chromosomes formed four bivalents at diacinesis in some cells but usually univalents were observed, two and four being the most frequent numbers. Multivalent formation among the chromosomes of the entire complement was rare, in spite of the high number of accessories. The bivalent accessories had as a rule no interstitial chiasmata, two terminal chiasmata being observed in some cases but very often only one such chiasma. Univalent accessories divided at anaphase I. A restitution nucleus was occasionally formed. In both meiosis I and II lagging of the univalents was more frequent than elimination. As shown from an examination of plants of Wasa II and other varieties with 4, 6, 7, 8 and 9 accessories, first pollen mitosis was disturbed with a frequency which increased as the number of accessories became greater. The main irregularities observed were comparable to tropocinesis, merostathmocinesis and stathmocinesis. In cells with normal mitosis, the accessories usually underwent nondisjunction. Possibly the partial or complete inhibition of the spindle was due to the subnormal spindle-organizing activity of the accessories.

1604 LUNDQVIST, A.
Self-incompatibility in rye. II. Genetic control in the tetraploid.
Hereditas, Lund 1957 : **43** : 467–511.

As indicated by observations on seed setting, no completely self-compatible plants were found upon selfing tetraploid élite populations of Stålråg [Steel rye]. In addition the frequency of highly self-compatible S_1 $4n$ plants derived from self-incompatible parents was considerably lower than the corresponding frequency in the diploids. Comparing the self-incompatible plants, it was however found that seed setting upon selfing was slightly but significantly higher in the tetraploid élite population than in the diploids. Annual differences in seed setting were much higher in the tetraploids. Intercrosses between chromosome-doubled siblings, obtained from the diploid sib mating $S_{1\cdot 1}$ $Z_{3\cdot 3}$ x $S_{1\cdot 1}$ $Z_{3\cdot 4}$ [cf. XXVII, 1682], provided evidence that two homoalleles at one locus in the pollen, when matched in the style, are not able alone to render the diploid pollen incompatible. Data on seed setting within groups of reciprocally incompatible tetraploids in matings with a common tester indicated that, at least in the case of one locus, only one allele of a heterothallic pair in the pollen need be matched in the style for the diploid pollen to be incompatible. This locus does not undergo double reduction. It is concluded that the incompatibility reaction depends upon cooperation between loci S and Z. One such factorial pair in the pollen, when matched in the style, is sufficient for incompatibility. The occurrence of competitive interaction within the loci is thought to be unlikely but the possibility of such interaction requires investigation. On the basis of the above hypothesis, formulae are given for calculating general cross compatibility and stability against loss of alleles due to random drift in a tetraploid population. Lack of compatible pollination in tetraploid rye may be a problem more serious than hitherto expected and selection for regular meiosis may not be successful. Stability against loss of alleles by random drift however greatly increases at the tetraploid level.

1605 BISKUPSKI, A.
Próba oceny metod badania wartości wypiekowej żyta z punktu widzenia różnic odmianowych. (**An attempt to evaluate methods of studying the baking value of rye from the point of view of varietal differences**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 579–96.

In studies of varieties grown at 39 stations in Poland, the direct baking method, using yeast with added lactic acid, proved best. Each variety was represented by a mixture of green, yellow and mottled grains, the green generally having a higher protein content and viscosity than the yellow and the mottled being variable. A positive correlation of 0·71 was obtained between 1000-grain weight and dough fermentation.

1606 ANTROPOVA, V. F.
(**Rye from Corsica**).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. **3** : 58–59. [Russian].

The Corsican rye differs from all others, even that of the adjacent Mediterranean countries. It has an exceedingly long vegetation period and procumbent habit and may be of interest for breeding forage plants.

1607 Kranz, A. R.
Populationsgenetische Untersuchungen am iranischen Primitivroggen. Ein Beitrag zur Systematik, Evolution und Züchtung des Roggens. (**Investigations on population genetics in primitive Iranian rye. A contribution to the systematics, evolution and breeding of rye**).
Z. Pflanzenz. 1957 : **38** : 101–46.

The views of previous authors on the systematics and origin of cultivated rye are compared and contrasted. Observations were made on the progenies of 3707 rye samples collected in 1952–54 from wheat fields in 206 different localities in Iran. They were grown in Germany and arranged according to botanical variety and subjected to gene-frequency and phenotype analysis for certain characters. Forms with brittle ear formed a low proportion of the total collection but occurred with some frequency in certain areas. No perennial forms occurred but certain specimens belonging to *Secale vavilovii* were found; they were cleistogamous and it is thought that very little crossing occurs between this species and *S. cereale*. Coloured ears were more frequent in the north-westerly part of the country. Pigmentation of the auricle occurred most frequently in the areas where *S. montanum* is most common and the character is thought to be derived from that species. Forms with three florets in the spikelet were most frequent in the extreme eastern and western areas and may be derived from crosses with *S. sylvestre*. Winter types were most frequent in the areas of higher altitude and least in those where coloured ears were most common. Values for straw length, tiller number and flower number, separately and combined, differed significantly in populations from different areas, the differences increasing proportionally with the distance between the areas.

A comparison of the same populations grown in Iran and in Germany showed that the brittleness of the ears was less under German conditions than in Iran, natural selection in favour of this character being consequently reduced.

The populations were characterized by a high degree of self fertility, which varied in different populations and reached 49% in the cleistogamous plants belonging to *S. vavilovii*. The vigour of the inbred plants varied too, being greatest in the populations with high self fertility, which also had the lowest number of lethal factors leading to loss of plants in the I_1 generation. Such self-fertile populations are thought to have originated by natural selection in relatively small isolated populations where the rye plants occur only as isolated individuals in fields of wheat. The same circumstance, together with others such as the brittleness of the rachis, has favoured the evolution of local populations differing in morphological as well as physiological and ecological features. The opposite tendency has been favoured by cross pollination, with the result that these primitive ryes have never reached the high degree of differentiation that is found in the wild species of *Secale* and it is thought more probable that cultivated rye has evolved polyphyletically, as a weed in wheat fields, rather than from a single ancestral form.

From the breeding point of view the material studied is of interest on account of the self-fertile forms, the short forms with strong straw and those with high stem and leaf production.

1608 Virtanen, A. I. & Hietala, P. K.
An antifungi factor in rye seedlings.
Suomen Kemistilehti 1955 : **28B** : 165–66.

An antifungal factor strongly inhibiting the growth of *Fusarium nivale* (*Calonectria nivalis*) has been isolated from rye seedlings and identified as 2(3)-benzoxazolinone. In four varieties, differing quantities were found which are believed to be responsible for differences in resistance.

MAIZE

1609 Fabergé, A. C.
The possibility of forecasting the relative rate of induced loss for endosperm markers in maize.
Genetics 1957 : **42** : 454–72.

"1. The nature of single marker losses observed in maize endosperm, when pollen carrying dominants is irradiated, is discussed. It is pointed out that: a. there is little or no selection. b. losses are preponderantly chromosomal rather than genic. c. an approximate model of chromosome behavior following breakage can be deduced from multiple point experiments. d. the rate of breakage is about proportional to pachytene length.

"2. It follows from the preceding that enough information is available to attempt an approximate forecast of relative loss rate for any marker whose cytological position is known.

"3. Using only constants estimated from markers in the short arm of chromosome 9 a tentative forecast is given for other endosperm markers located elsewhere.

"4. Published data are analyzed to establish the observed relative loss rates for Sh_1, Su, R, Pr and A_1.

"5. It is shown that the forecast places these five markers in the correct order of sensitivity, and moreover gives their relation to one another about correctly.

"6. It is concluded that the forecast is real and cannot, within reasonable limits of probability, be considered fortuitous.

"7. The effects of the chromosome model considered on expected dosage effect curves, and on the influence of position in the chromosome arm on sensitivity are discussed."

[Author's summary].

1610 MONZÓN, D.
Análisis e interpretación de un ensayo de uniformidad con maíz. (**Analysis and interpretation of a uniformity trial with maize**).
Agron. trop., Venezuela 1956 : **6** : 15–22.

An experiment for determining the plot size giving the yield with the greatest efficiency is described and analysed. Three-row plots 6 m. wide proved best.

1611 GRAEBER, W.
Maisanbau in Österreich. (**Maize cultivation in Austria**).
Mitt. dtsch. LandwGes. 1957 : **72** : 1140–42.

In this review Austrian seed testing and variety trials in progress at Marchfeld are mentioned. At Bruck and Gleisdorf some promising hybrids have been produced.

1612 SORIA V., J.
Selecciones de maíz en la Estación Experimental Tropical de Ecuador. (**Maize selections at the Tropical Experimental Station of Ecuador**).
Turrialba 1956 : **6** : 86–88.

Eleven selections from uncontrolled crosses between a local variety and Cubano Amarillo [Cuban Yellow] were selfed and, after reproduction without selection, were subjected to further mass selection; five of these selections gave grain yields significantly higher than that of the original variety, the differences being of the order of 100%. There was no significant difference between the five selections.

1613 WHISTLER, R. L.
Raw material for industry.
What's New Crops Soils 1957 : **10** : No. 2 : 16–17.

Mention is briefly made of maize breeding programmes at the Purdue, Indiana and Missouri Agricultural Experiment Stations, in the course of which the amylose content of the endosperm has been raised from 25% to about 80% without decreasing the total starch content.

1614 BRINK, R. A. & WEYERS, W. H.
Invariable genetic change in maize plants heterozygous for marbled aleurone.
Proc. nat. Acad. Sci. USA 1957 : **43** : 1053–60.

A heritable change resulting in a markedly altered phenotypic expression of R^{rr} (self-coloured aleurone) has been found to occur regularly in $R^{\mathrm{r}}R^{\mathrm{mb}}$ plants (heterozygous marbled aleurone). No evidence of a concurrent change in R^{mb} was obtained. The altered expression of R^{r} consists of a reduction in pigment-producing potential. The altered form of R^{r}, designated $R^{\mathrm{r:mb}}$, regularly reverts partially to the standard level of the pigment-producing action of R^{r} in $R^{\mathrm{r:mb}}R^{\mathrm{r:mb}}$ individuals. Such reversion does not occur, at least regularly, in the genotype $R^{\mathrm{r:mb}}r^{\mathrm{g}}$; $r^{g}r^{\mathrm{g}}$ results in colourless aleurone and green plants. This behaviour of R^{r} is parallel to that previously described in $R^{\mathrm{r}}R^{\mathrm{st}}$ (heterozygous stippled) plants [cf. XXVII, 4004]. The two altered forms of R^{r} differ, however, both in the aleurone pattern which they condition and in the extent to which they revert towards the standard level of R^{r} pigmentation when homozygous.

1615 KELLEHER, T. M.
Analysis and interpretation of variation of inbred lines and F_1 crosses in corn.
Diss. Abstr. 1957 : **17** : Publ. No. 20,181 : p. 482.

Two methods of analysing quantitative characters were compared: (1) a regression procedure in which a particular functional relationship is postulated for parents and offspring and (2) the standard method of partitioning variation into hereditary, environmental and interaction components. Maize inbreds and hybrids obtained by mating at random provided the experimental material; the characters studied were plant height and yield. The regression method proved a useful adjunct to component analysis but, since it depends on assumptions that are often not fulfilled, must be used in conjunction with more adequate methods.

1616 Di Martino, V.
130 quintali di granoturco per ettaro. (**130 centners of maize per hectare**).
Agric. bresciano 1957 : **5** : No. 43 : 1, 2.

A record yield of 129·33 c. of dry grain per ha. is reported for the hybrid Cervino 13 per 8 [Cervino 13 x 8] grown under irrigation in the Brescia area of northern Italy; the hybrid flowers a week later than 1141 but develops quickly after that, having a maturity rating of 142 days.

1617 Di Martino, V.
Nuovi tipi di mais ibridi per le colture di secondo raccolto. (**New types of hybrid maize for use as second crop**).
Agric. bresciano 1957 : **5** : No. 49 : p. 4.

Two hybrids, S1 and S2, suitable for sowing in late June after wheat are described. They gave yields of 59·20 c. and 54·90 c. per ha. respectively in 1957 under conditions where the local Quarantino [Forty-days] gave 42·10 c. per ha. and are also more resistant to damage by wind, corn borer, *Sesamia* and *Helminthosporium*.

1618 Giosan, N. & Moşneagă, V.
Consfătuirea unională de la Dnepropetrovsk in problema organizării producerii de seminţe hibride de porumb. (**The union conference at Dnepropetrovsk on the problem of organizing the production of hybrid-maize seed**).
An. Romîno-Soviet. : Ser. Agric. 1956 : No. 5 : 69–85.

A Rumanian account is given of the 1956 Soviet conference on hybrid maize production [cf. XXVI, 3258].

1619 Musijko, A. S.
(**Some questions of introduction of hybrid maize**).
Agrobiologija (Agrobiology) 1957 : No. 4 : 29–38. [Russian].

Much of what is included in this account of breeding work with maize at Odessa has been referred to earlier [XXVI, 3077 and XXVII, 2618–20]. Among the more recent results are top crosses such as Voronež 76 x (44 x 38) which are 6–10 days earlier and more productive than the double-cross hybrid VIR42 and a new hybrid L x KS, which ripens still earlier and is suitable for preceding winter wheat in the Ukraine. Mention is made of a number of hybrids obtained by crossing early with late varieties, for instance Voronež 76 x Odessa 10; these yield one and a half times more grain and forage in the northern districts than the early northern varieties and only ripen a little later.

1620 Grogan, C. O. & Zuber, M. S.
Missouri hybrid corn yield trials 1955.
Bull. Mo. agric. Exp. Sta. 1956 : No. 667 : Pp. 12.

Zuber, M. S. & Grogan, C. O.
Missouri hybrid corn yield trials 1956.
Sta. Bull. Mo. agric. Exp. Sta. 1957 : No. 682 : Pp. 12.

The results of trials of commercial and experimental hybrids are reported.

1621 Zuber, M. S. & Grogan, C. O.
Corn hybrids for Missouri.
Bull. Mo. agric. Exp. Sta. 1956 : No. 673 : Pp. 12.

Detailed descriptions are given of recommended open-pedigree hybrids, together with summaries of their performance records. Data on the performance of other commercial hybrids and of experimental entries during a period of two or more years are also summarized.

1622 Nakamura, N.
(**Statistical studies on combining ability in maize**).
Hyogo Noka Daigaku Kiyo/Mem. Hyogo Univ. Agric. 1956 : **2** : No. 2 : Pp. 53. [Japanese].

In the mathematical introduction to this paper, the relationships between general and specific combining ability and genotype are examined, on the assumptions of (1) additive and (2) geometric gene action. The conclusion is drawn that general combining ability is an index of the number of effective genes while specific combining ability is an index of the number of common genes and of interaction between alleles.

The above analysis is applied to data on yield and height in the F_0 of several series of inbred lines and of all possible F_1 combinations within each series. General and specific combining abilities and the corresponding variances were calculated for each line. The parental lines were classified into groups on the basis of negative specific combining ability between lines of the same group. The correlation between grain yield and height was not always significant.

Productivity of synthetic varieties as predicted from the general combining abilities of the lines used and the actual yields were in good agreement.

1623 CLEMENTS, T. E.
Dwarf corn.
What's New Crops Soils 1957 : **10** : No. 3 : 18, 20.

The production of dwarf maize hybrids incorporating the brachytic-2 gene and the advantages of such hybrids are described in this popular article.

1624 MAGUIRE, M. P.
Cytogenetic studies of Zea hyperploid for a chromosome derived from Tripsacum.
Genetics 1957 : **42** : 473–86.

The studies reported here were carried out on progeny from the third back cross to maize of plants from the hybrid *Zea mays* x *Tripsacum dactyloides*. They carried 20 maize chromosomes and a single chromosome, with a terminal knob, from *T. dactyloides*. A high frequency of trivalent formation between this chromosome and chromosome 2 of maize was observed and the terminal knob was occasionally transferred to the end of the short arm of this maize chromosome by some mechanism other than crossing over. It is suggested that in an earlier generation an exchange of material occurred between these chromosomes involving segments sufficiently homologous to allow normal pairing. Chiasma formation usually followed pairing between the *Tripsacum* chromosome and chromosome 2 of maize. Evidence was found that the *Tripsacum* chromosome normally carries *Lg* and *Gl* loci on its long arm and the frequency of genetic recombination between these two loci is thought to be consistent with the unexpectedly high frequency of metaphase I chiasmata observed between the *Tripsacum* and maize chromosomes. Plants carrying the *Tripsacum* chromosome were significantly different in respect of several morphological characters from plants without it.

1625 NUFFER, M. G.
Additional evidence on the effect of X-ray and ultraviolet radiation on mutation in maize.
Genetics 1957 : **42** : 273–82.

Treatment of maize pollen, carrying the $\alpha\beta Sh$ segment, with ultraviolet radiation, resulted in some changes of β while treatment with X rays caused changes in $\alpha\beta$ but not β alone. In addition in both cases a high frequency of loss of the whole segment was observed. It could not be proved that either X rays or ultraviolet radiation produced reversible mutants in a gene which is known to produce reversible mutations spontaneously.

1626 GRAF, G. E.
Chromosome breakage induced by X-rays, maleic hydrazide and its derivatives.
J. Hered. 1957 : **48** : 155–59.

A comparison of the effects of maleic hydrazide and three maleic hydrazide derivatives on four maize varieties has shown that the number of anaphase bridges produced is highly correlated with the number of heterochromatic knobs possessed by the variety and it is concluded that at least some chemicals cause chromosome breakage selectively in heterochromatic regions. No such correlation was observed when X rays were used to induce breakage.

1627 POSTLETHWAIT, S. N. & NELSON, O. E. (JUN.)
A chronically wilted mutant of maize.
Amer. J. Bot. 1957 : **44** : 628–33.

A single recessive gene, *wi*, caused severe wilting throughout most of the growing period, since it delayed differentiation of the large metaxylem vessels. Eventually the metaxylem vessels differentiated, developing normally in some vascular bundles, but showing compression in others probably as the result of the mechanical pressure of previously differentiated vascular components. With the corresponding increase in conductive efficiency, the leaves of the plants became normal in upward succession.

1628 ELITROPI, C.
Contributo alla conoscenza della biologia fiorale e della tecnica d'impollinazione artificiale del mais (*Zea mays* L.). Parte I.
[A contribution to the knowledge of the floral biology and methods of artificial pollination in maize (*Z. mays* L.). I].
Ann. Sper. agr. 1957 : **11** : 1475–93.

Tables are included showing the number of days to tasselling, divided into stages, of several maize lines studied at the Experimental Station for Maize Growing, Bergamo, Italy.

1629 TOVMASJAN, O. V.
(The inheritance of the characters of two pollinator varieties in maize).
Agrobiologija (Agrobiology) 1957 : No. 2 : 25–30. [Russian].

The white-grained variety Sterling was fertilized by either one variety or mixed pollen of two other varieties at Gorki Leninskie, the pollinators all having coloured grain. Analyses of the F_1 plants showed that a higher percentage of coloured grain was obtained in pollinations by one variety than by mixed pollen of two varieties. Some F_2 plants inherited grain colour from both pollen parents. The number of these plants varied, depending on the components employed in the initial cross and on the grain colour in the F_1.

Over half of the F_2 inbreds from the white-grained F_1 plants bore ears with some coloured grain and it is suggested that the white-grained plants, too, must have arisen by hybridization. This contention is supported by experiments on open pollination of such varieties as Risovaja Belaja [White Rice] with a number of varieties having coloured grain; the F_1 plants in this case bore heterotic white grains.

1630 HOUSE, L. R.

A study of the genetical and physiological bases of cross-sterility in maize.

Diss. Abstr. 1957 : **17** : Publ. No. 19,414 : 208–09.

Data from F_2 progenies of crosses of the cross-sterile inbred 401–127 with marker stocks revealed the presence of gametophytic factors for cross sterility at Ga_1 on chromosome 4 and Ga_2 on chromosome 5 of the inbred. An indication of other gametophytic factors on chromosomes 3 and 9 was also obtained. Tested in a similar way, six other cross-sterile inbreds were each found to carry a gametophytic factor at Ga_1. Three of the inbreds also had a factor at Ga_2. One inbred may have had a gametophytic factor on chromosome 7; in three others such a factor may have been present on chromosome 9.

The F_1, F_2 and back-cross progenies resulting from crossing 401–127 with inbred Hy (*ga ga*) were detasselled and the percentage seed set obtained from each ear within each progeny as the result of pollination with incompatible pollen (*ga*) was recorded. Comparison of the results from progenies involving 401–127 with those from similar tests of other cross-sterile inbreds indicated that control of sterility in 401–127 is different from that in the other inbreds. In addition, 401–127 and six other inbreds were crossed in all possible combinations; 401–127 failed to set seed when pollinated by several of the inbreds. It is postulated that cross sterility in 401–127 depends upon a multifactorial system.

Using radioactive pollen, the growth rate of incompatible pollen tubes was found to be lower than that of compatible ones. Incompatible tubes grew only 26 mm. before cessation of growth.

Sterility may be associated with an excessively high concentration of indole-3-acetic acid. Maize coleoptiles reached significantly greater length in extracts from silks pollinated incompatibly than in extracts from silks pollinated compatibly or not pollinated.

1631 MARIĆ, M.

(A contribution to the study of double-cross intervarietal and synthetic F_1 hybrids of yellow and white maize).

Zborn. Rad. poljoprivred. Fak./Rev. Res. Wk. Fac. Agric. Beograd 1957: **5**: 151-74. [Serbian].

Multiple hybrids, some with yellow, others with white grain, have been bred at Belgrade. Double-cross intervarietal hybrids were obtained by crossing two Jugoslav intervarietal hybrids. So-called synthetic hybrids were obtained by crossing single-cross Jugoslav intervarietal hybrids with double-cross American interline hybrids. The parents of all combinations had the same grain colour. Heterosis was observed in all cases; in the synthetic hybrids it was expressed as improvement in ear length and number of grains per ear; in the double-cross hybrids, it was expressed as greater earliness and more ears per plant. Synthetic hybrids with yellow grain were more productive than those with white grain. A contrary result was observed with the double-cross hybrids. The highest yields of all were in the double-cross white-grained hybrids. The higher yield of hybrids with white grain is explained by a high degree of homozygosis of the white-grained Jugoslav varieties as compared with the yellow-grained varieties.

1632 BRIGGLE, L. W.

Interactions of cytoplasm and genes in a group of male sterile corn types.

Agron. J. 1957 : **49** : 543–47.

Maize lines deriving their cytoplasmic male sterility from one of seven distinct sources were crossed with a series of differential testers for restoration of fertility. The original male-sterile stocks comprised: USDA, Brazilian, Texas, the two single crosses 33–16 x Mo2Rf and M1984 x M14, stock Vg with the genotype *Vg sy j -/- sy -* v_{16}, and Reid. The USDA, Brazilian, Vg and Reid types did not differ greatly in cytoplasm-gene interactions in respect of pollen fertility. The Texas type was markedly different from the other six. The two single crosses are difficult to compare with the other types but they appeared to differ from each other and from the other types in cytoplasm-gene interaction. Probable modifiers in certain inbred differentials appeared to have a greater influence on the expression of the USDA type than on that of the Texas type. Of the six original stocks tested only M1984 x M14 showed a significant effect of planting date upon expression of male sterility. Planting date had however a marked effect upon pollen sterility in a number of F_1 crosses of the stocks with differential testers. It is suggested that some of the modifiers affecting male sterility may only attain penetrance under particular environmental conditions. The Vg and Reid cytoplasmic components have similar reactions with the genotype of inbred Ky21. Modifiers appeared to have been introduced from either Vg or Reid male-sterile lines, causing some degree of sterility in combinations with genes from Ky21. Such modifiers could be eliminated by introducing the cytoplasmic sterility into a suitable recurrent parent and back crossing until the progeny were completely sterile.

1633 COSTA-RODRIGUES, L.
Milhos sacarinos. II. Ensaios de adaptação. (**Sugar maizes. II. Tests of adaptation**).
Agron. lusit. 1957 : **19** : 57–69.

Observations were made in Portugal and in the Azores on the Spanish hybrids with sweet stems [cf. XXVI, 2317 and XXVII, 2935] and certain others possessed of the same properties, measurements being made of yield of grain and green matter and the sucrose content of the stems. The variations in sugar content at different times after harvesting the grain were greater than those between varieties but the figures made it possible to indicate the most suitable hybrids for cutting 30 and 60 days after grain maturity respectively, for the production of alcohol. It is pointed out that the refractometric readings do not necessarily provide an accurate criterion of the alcohol-producing capacity.

Some of the hybrids are considered to be promising for the production of grain and forage alone, regardless of whether they are also used for alcohol manufacture.

1634 GALINAT, W. C.
The effects of certain genes on the outer pistillate glume of maize.
Bot. Mus. Leafl. Harvard 1957 : **18** : 57–76.

In studies of the anatomical effects of the dominant or semidominant genes *Pn* lying on chromosome 7, conditioning papyrescent glumes, *Tu* on chromosome 4, giving tunicate glumes, and *Vg* on chromosome 1, expressed as vestigial glumes, *Pn* glumes were at first fleshy and largely parenchymatous and finally became desiccated and transparent with the vascular bundles forming prominent ridges; *Tu* glumes had all the characteristics of a typical leaf sheath but on a reduced scale, showing decreased lignification in comparison with the normal state; and *Vg* glumes were short and thick with increased lignification occurring during caryopsis development. It is suggested that the *Tu* locus, which includes a series of multiple alleles, may have been involved in the earlier evolution of the maize glumes, the leaflike character being typical of that found in the Andropogoneae, while *Vg* represents a potential ability in maize to evolve a tripsacoid type of glume.

1635 POPOV, G. I.
(**Changes in maize plants**).
Agrobiologija (Agrobiology) 1957 : No. 3 : 90–98. [Russian].

Sterling, VIR42 [Institute of Plant Industry 42], Kremnistaja Skorospelka [Early Flint] and other varieties showed modifications in respect of most parts of the plant on being subjected to unusual conditions at Leningrad. Changes, which are thought to be heritable, occurred when the grain was sown in the open in June or the plants were subjected to varied artificial treatments such as keeping germinated seed on ice for a period of 11–19 days, then subjecting the young plants to a 10 hr. day and temperatures of 12–14° C. in the hothouse for a period of 31–34 days before transferring them outside. Changes observed in the different parts of the plant included modifications of inflorescences and the mode of tillering and branching. Some forms for instance had branched stems and mixed inflorescences resembling those of *Tripsacum dactyloides*, with pistillate flowers at the base and staminate flowers at the top. Other plants had staminate and pistillate flowers arranged as in *Polytoca*.

1636 (**Maize for use as green forage and silage**).
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1957 : No. 11 : p. 27. [Russian].

Moscow 3 and Moskovskaja Populjacija [Moscow Population] were bred at the Moscow Breeding Station. They produce ripe ears in September after sowing in April under the climatic conditions of the Nonchernozem Belt and their stems and leaves are still green at harvesting and are suitable for silage.

1637 SVÁB, J.
A fajta és tenyészterület kölcsönhatása kukoricakísérletekben. (**The interaction between variety and planting distance in maize trials**).
KisérlÜgy. Közl. 1956 : **50** : 89–101.

At the Hungarian National Institute for Crop

Variety Testing, trials of six genetically different varieties, using 70 x 50 cm. and 70 x 70 cm. spacing, showed no interaction between variety and spacing but the spacing factor was significant in every case and in two cases was significantly greater than the variety factor. Further investigations to discover the most economical layout for eliminating spacing effects are in progress.

1638 LASCOLS, X.
Étude de quelques populations françaises de maïs précoce: essais de valeur hybride. (**Study of some French populations of early maize: experiments on combining ability**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 139–57.

The combining ability of 22 French open-pollinated varieties of early flint maize was analysed in some three-way crosses with an American dent hybrid (WH x WJ). Each variety was represented by S_1 lines; hybrids from lines chosen by visual selection gave significantly higher yields than hybrids from lines discarded by visual selection. Marked differences in combining ability were found between varieties of different origin; some Pyrenean varieties gave hybrids which were particularly promising for their yield, earliness and resistance to lodging.

1639 MESSIAEN, C. M. & LAFON, R.
Les champignons nuisibles aux semis de maïs. II. Essais de traitements de semences. (**Fungi harmful to maize seedlings. II. Trials with seed treatments**).
Ann. Inst. nat. Rech. agron., Paris : Sér. C. : 1957 : **8** : 209–24.

The resistance to *Gibberella zeae* of a number of hybrids cultivated in France is recorded; INRA200 is highly resistant.

1640 RĂDULESCU, E. *ET AL.*
Rezultate experimentale preliminare referitoare la combaterea tăciunelui prafos al porumbului—*Sorosporium Holci-Sorghi* (Rivolta) Moesz. [**Preliminary experimental results on combating *Sorosporium Holci-Sorghi* (Rivolta) Moesz attacking maize**].
Anu. Lucr. şti., Cluj 1957 : **13** : 273–78.

Data are included on the relative susceptibility of Rumanian varieties. The most resistant forms were Lăpusneac and Arieşan [maize from Arieş].

1641 RIEGEROWA, H. & SŁABOŃSKI, A.
Badania nad odpornością odmian kukurydzy na głownię metodą polowych zakażań. (**Investigations on the smut resistance of maize varieties by the method of field infection**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 31–59.

Of 41 maize varieties tested in Poland during 1951–54 for resistance to *Ustilago zeae,* none was fully resistant, but seven were classed as being of low susceptibility.

1642 VOISIN, J.-C.
Premiers essais intervariétaux de maïs dans le Sud-Cameroun. (**First intervarietal trials of maize in the South Cameroons**).
Riz et Rizic. 1957 : **3** : 163–68.

On account of their higher resistance to *Puccinia polysora,* some Central American varieties gave higher yields than African varieties in tests held in the southern forest region of the Cameroons.

1643 WISER, W. J.
Inheritance of reaction to *Diplodia zeae* (Schw.) Lev. in *Zea mays* L. ears.
Diss. Abstr. 1957 : **17** : Publ. No. 18,880 : 12–13.

In a study of all the single crosses possible among six inbreds, their F_2 and the back crosses to both parents, data were collected on (1) degree of husk coverage, (2) time of ear declination and (3) amount of infection by *D. zeae.* Evidence of additive gene action was obtained with respect to percentage of ear rot but this action was marked by epistasis in single crosses involving inbreds differing widely in reaction. Poor husk cover showed a highly significant correlation with high percentage of ear rot in F_2 progenies from crosses having one or both parents susceptible but not in those from crosses having both parents resistant or intermediate in reaction. Back crossing to the more resistant parent tended to preclude a significant correlation. Delayed ear inclination was associated with a high percentage of ear rot in crosses of extremely susceptible lines with resistant or intermediate lines, and less commonly in crosses between resistant lines; no such correlation was detected in crosses between very susceptible parents or between resistant and intermediate lines. A significant correlation was obtained more often in back crosses to the more resistant parent than in back crosses to the more susceptible inbred. The deficiency of intermediate classes in the F_1 and segregating progenies is interpreted in terms of probability of infection.

1644 Česnokov, P. G.
(Resistance of maize varieties to frit fly).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : 3–5. [Russian].

Under conditions where the majority of varieties had 40–60% of infested plants and some had up to 70%, the variety Gengutskaja Želtaja 11116 [Hengut Yellow 11116] had only 16·3%, VIR–25 [Institute of Plant Industry 25], 25% and VIR–10, 26·2%. Some varieties suffered less reduction in yield of green matter than others with the same degree of infestation.

1645 Beck, S. D. & Stauffer, J. F.
The European corn borer, *Pyrausta nubilalis* (Hubn.), and its principal host plant. III. Toxic factors influencing larval establishment.
Ann. ent. Soc. Amer. 1957 : **50** : 166–70.

Of two or more toxic substances found in maize plants and having a deleterious effect on the growth and survival of borer larvae, one has been isolated and named resistance factor A. The content of this factor was greater in the resistant inbred W210D than in the susceptible W204 and decreased with increasing plant height in both inbreds as does resistance to borer establishment. Some indications of an environmental effect upon resistance factor A activity have been noted.

1646 Loomis, R. S., Beck, S. D. & Stauffer, J. F.
The European corn borer, *Pyrausta nubilalis* (Hubn), and its principal host plant. V. A chemical study of host plant resistance.
Plant Physiol. 1957 : **32** : 379–85.

Aqueous extracts of maize plants contained substances inhibiting the growth of *Penicillium* and corn borer. About one half of the inhibitory activity was due to an ether-soluble substance termed resistance factor A (RFA), which was identified as 6-methoxy-2(3)-benzoxazolinone. The ether-insoluble residue contained an additional inhibitor (resistance factor B), accounting for the remainder of the activity of the extracts. RFA accumulated throughout the development of the plants, the leaves having the highest and the stems the lowest concentrations. Assay data for RFA activity in different plant portions of the resistance inbred W210D and susceptible inbred W204 revealed differences which may be important in determining the reaction of the inbreds to borer establishment.

1647 Kavanagh, L. R.
Which hybrid should I sow?
Agric. Gaz. NSW 1957 : **68** : 344–52.

The results of yield trials held in various districts of New South Wales with early, mid-season and late-maturing hybrids are presented.

1648 **1954 and 1955 trials of the West African Maize Research Unit, Department of Agriculture, Moor Plantation, Ibadan, Nigeria.** 1957 : Pp. 53. (Mimeographed).

The trials of which the results are given here include extensive tests of varieties at several localities in Nigeria and Ghana, trials to estimate the yielding ability of a collection of maize lines from the Caribbean region under the conditions prevailing at Ibadan and preliminary testing of hybrids between rust-resistant or partially resistant lines from the New World and lines already under trial at Ibadan.

BARLEY

1649 Gaul, H.
Die Wirkung von Röntgenstrahlen in Verbindung mit CO_2, Colchicin und Hitze auf Gerste. (**The action of X rays in combination with CO_2, colchicine and heat on barley**).
Z. Pflanzenz. 1957 : **38** : 397–429.

The effect of treatment with CO_2, heat or colchicine in addition to X irradiation was studied in barley seedlings. Less physiological damage occurred than is usually found in irradiated seedlings. The frequency of chromosome mutation in the germ cells was decreased and the maximum effect occurred when all three additional treatments were given; bridges became relatively more frequent than fragments. Point mutations such as chlorophyll mutations of the *viridis* and *xantha* type increased but the frequency of *albina* mutations was unaffected. An increase in translocation may account for the higher frequency of point mutation. Macromutation also increased.

1650 Sedlmayr, K.
A magyar ősziárpanemesítés időszerű kérdései. (**Current problems of breeding winter barley in Hungary**).
Agrártudomány 1956 : **8** : 7–11.

Current breeding objectives in Hungary are discussed. Frost resistance has been attained in the BETA varieties, but improvements in earliness, lodging resistance, mildew resistance and quality, especially protein content, are still required.

1651 Favret, E. A. & Rodríguez, A. A.
Inducción de mutaciones en cebada con tratamientos de formaldehida. (**Induction of mutations in barley with formaldehyde treatment**).
Rev. Invest. agríc. B. Aires 1957 : **11** : 305–07.

Treatment of grain with dilute formaldehyde for various lengths of time produced a marked lethal effect and retarded germination but did not cause visible chromosome damage or ovule sterility in the surviving plants. The mutation rate, with respect to chlorophyll mutants, varied with the proportion of survivors, the highest rate of 0·46%, i.e. 6–7 times the spontaneous rate, occurring at a survival rate of 10–30%. The variation occurred mainly in mutants other than albinos, the rate of production of the latter being little affected by formaldehyde.

1652 Favret, E. A. & Rodríguez, A. A.
Mutabilidad espontánea en cebada. (**Spontaneous mutation in barley**).
Rev. Invest. agríc. B. Aires 1957 : **11** : 309–11.

In studies carried out in Argentina, the average rate of production of spontaneous chlorophyll mutants per spike in *Hordeum vulgare* 'Engledow India', 'Monte Cristo' and 'Trebi' and *H. distichum* 'La Previsión 19' and 'Maltería Heda' was $0{\cdot}7 \times 10^{-3}$, nearly half of these being albinos ($0{\cdot}3 \times 10^{-3}$). The varieties Engledow India and Monte Cristo, both carrying the same dominant gene for immunity to race Arg.2 of *Erysiphe graminis*, underwent mutation to susceptibility at a rate of $1{\cdot}1 \times 10^{-4}$. No mutants in the reverse direction were obtained in the three susceptible varieties.

1653 Scholz, F.
Mutationsversuche an Kulturpflanzen. VII. Untersuchungen über den züchterischen Wert röntgeninduzierter Mutanten verschiedener Merkmalsgruppen bei Sommer- und Wintergerste. Teile 1 und 2. (**Mutation experiments with cultivated plants. VII. Investigations on the breeding value of X-ray induced mutants of different character groups in spring and winter barley. Parts 1 and 2**).
Z. Pflanzenz. 1957 : **38** : 181–220, 225–74.

A rather fuller review of the literature on induced mutations in crop plants than those hitherto published is presented and the results of experiments carried out at Gatersleben, Eastern Germany, are presented. The treatment consists of irradiating air-dry grains with doses of X rays from 12 kr. to 15 kr. So far 300 mutants have been found in winter barley and 460 in spring barley, a number of them being phenotypically identical and probably due to the same mutant gene. Full descriptions are given of the varieties used. The mutants included *erectoides*, naked-grain, smooth-awned, six-rowed, early-ripening, large-grained and high-yielding types in spring barley and early-ripening, mildew-resistant, dense-eared and long-strawed mutants in winter barley. Most mutants differed from the parental form in more than one character.

Part 2 presents the results of yield trials carried out with some of the most interesting mutants from the practical point of view.

Yield tests have been carried out with 85 of the winter barley mutants and 104 of the spring, the results being compared with the highest-yielding variety for the area, Donaria. The results showed that most of the 16 early-ripening mutants of spring barley were somewhat lower in yield, especially those ripening up to 10 days earlier than the parent; some mutants ripening only a few days earlier gave up to 98·7% of the yield of the parent. The large-grained mutants were also lower in yield, the best of them giving 99·6% of the grain yield of the parent variety Donaria; their straw yield on the other hand was higher and some of them were better in strength of straw; some had higher protein content. Mutants combining large grain with earliness were also mostly lower in yield but at least three of them gave yield increases, one by an average of 28·1% over the period 1950–55; the mutants in this group were often better in strength of straw and somewhat higher in protein content. Certain lines selected from irradiated material of Donaria were identical with Donaria in morphological characters and in yield but differed in straw yield, some being higher and some lower.

Most of the *erectoides* mutants give fairly satisfactory yields, the best of them having given a five-year average of 5·5% more grain than Donaria at Gatersleben and 9·2% at Quedlinburg; in straw yield they are all lower; most of them ripen 1–2 days earlier and are only slightly higher in protein content and husk percentage.

Two naked-grain mutants have been found, one from Donaria and one from Haisa; in other characters they were indistinguishable from the parent varieties and were also equal to them in grain yield when allowances were made for the absence of husk. Both fully and partially smooth awns appeared among the mutants and most of them exceeded the parent form in grain yield; one Haisa mutant with almost smooth awns excelled Haisa by 12·6% in the five-year average and another group exceeded Haisa by 7·5% and had a higher 1000-corn weight, somewhat stronger straw, ripened about a day earlier and had about 1% higher protein (13·4 as compared with 12·4). Similar results are being obtained from a more recent mutant of Donaria with almost smooth awns. Most mutants with entirely smooth awns have previously been characterized by smooth stigma and reduced fertility but one such mutant has been found in which the stigmas and fertility were almost normal and the yield was 10% above that of Haisa, whilst strength of straw and 1000 corn weight were also improved.

The six-rowed mutants have all proved inferior to their two-rowed parents in yield of both grain and straw.

In winter barleys, 7 of the 9 early-ripening mutants tested exceeded the parental varieties in yield; one of them, for instance, was 7·8% above the parent, Kleinwanzlebener 12, in yield and ripened 5 days earlier; most of these mutants had stronger straw and somewhat lower protein content.

Seven mildew-resistant mutants of Friedrichswerther Berg have arisen in the experiments and by their use a new set of eight differential hosts for *Erysiphe graminis* f. sp. *hordei* has been established, on the basis of which 16 races have been identified. The mutants differed in the races to which they were resistant and there seem to be two major dominant genes, each governing resistance to a different group of races, though neither gene gives resistance to biotype C. In years with heavy mildew attack the mutants are less heavily infected than other winter barleys and are higher in yield and standing capacity, though they are somewhat lower in 1000-grain weight, straw yield and protein content; in winter hardiness they are equal to or only slightly below the parent. An eighth mutant was resistant to race C but was inferior in yield and other characters.

Most of the dense-eared mutants of winter barley have proved poor in yield; on the other hand quite high yields have been obtained from some tall-strawed mutants, which are somewhat later than the parent variety but not inferior in strength of straw, and are also more winter hardy. Slightly higher yields were given by a broad-leaved mutant, which was two days earlier and better in standing capacity. A narrow-leaved mutant was equal to the parent in yield but inferior in straw strength.

A number of crosses have been made between the mutants, over 50 combinations having been effected. In crosses between different early mutants transgressive segregation was observed, one combination being 18 days earlier in earing and 14 days earlier in ripening than the original parent variety. Such extreme forms are usually weak in growth however and hence low in yield. Transgression was also observed in crosses between different *erectoides* forms. Some of the crosses are now in the F_4 generation, an extra generation being obtained in the winter by growing under artificial light. All the characters combined freely, except for one case of linkage of *erectoides* and naked grain, which was broken by crossing over. One early mutant proved to be due to a single recessive, another to a single dominant gene. There were indications that both dominant and recessive genes were operative also in determining the large-grained mutations; dense ear in the *erectoides* mutants was recessive. The gene *n* in the two naked mutants has been shown to be the same as the gene in naturally occurring naked barleys. The smooth-awned mutants, both complete and partial, were all governed by a single recessive gene, though modifiers also seem to be operative. A *deficiens* mutant was found to be governed by a recessive gene distinct from that for the normal *deficiens*.

There were no indications in these crossing experiments that any deleterious effects were inherited in conjunction with the mutant changes under investigation. Crosses with the parent strain indicate that most or all features other than the mutant characters have remained unchanged.

Particularly good yields were obtained from crosses of the smooth-awned mutants, some of the hybrids having given a four-year average of 9·8% above the grain yield of the parent variety and 4·3% above that of the original mutant.

A combination of mutant characters has also been attained by further irradiation of some of the mutants. Thus from irradiation of a *nudoides* mutant a large-grained early mutant with naked grains and a naked-grained *erectoides* have been produced.

1654 Pollhamer, E.
Röntgen-mutációs kísérletek tavaszi árpa nemesítésében. (**X-ray mutation experiments in breeding spring barley**).
Növénytermelés 1956 : **5** : 307–20.

Information is presented on the mutant types obtained at the Martonvásár Agricultural Research Institute, Hungary, through X irradiation at 15,000 r. of dormant seeds of the two-rowed spring barley Martonvásár FB104. In the X_2 numerous cholorophyll mutants were obtained, most of them of the *albina* type, and some morphological and physiological mutants were selected, including line R1253 characterized by good standing capacity and the six-rowed form R644/1 which combines earliness with field resistance to mildew. Further irradiation of the X_2 resulted in a high proportion of *albina* and *xantha* types with a few other chlorophyll mutants, progenies from the twice-irradiated material showing a markedly higher mortality rate than those from plants irradiated once only.

1655 Moës, A.
Mutants progressifs chez l'orge. (**Progressive mutants in barley**).
Bull. Inst. agron. Gembloux 1957 : **25** : 108–15.

Grain from the variety Piroline was treated with X rays; 35 mutants were studied and these were found to vary considerably in a number of agronomic characters. Some mutants surpassed Piroline in yielding capacity, resistance to lodging or straw length.

1656 Peterson, G. A.
A statistical evaluation of early generation testing in a barley cross using related F_3, F_4, and F_5 lines grown simultaneously.
Diss. Abstr. 1957 : **17** : Publ. No. 21,256 : p. 1182.

Thirty families each including related F_2, F_3 and F_4 plant progenies randomly selected from Montcalm x Feebar, were grown in the F_3, F_4 and F_5 generations respectively as a single replicated trial. Data were obtained on the following ten characters: heading date, maturity date, plant height, lodging, head erectness, "visual rating", bushel weight, 200-kernel weight, "thins" and yield. Measurements on F_3 lines for heading date, maturity date and plant height appeared to be highly predictive of mean progeny performance in the F_4 and F_5. In view of the magnitude of the heritability estimates for the F_3 and F_4 as regards heading date and maturity date, as well as in view of the complexity of the inheritance of these two characters, as suggested in the literature, selection of individual plants for these two measurements is likely to be more efficient than selection based on early-generation progeny testing. Among all ten characters, plant height had the largest heritability estimates. The data indicated that a moderate degree of genetic advance may be expected with respect to 200-kernel weight, "thins", head erectness and bushel weight by selection for differences among F_3 lines. Heritability estimates for lodging score, visual rating score and yield were among the lowest for any of the ten characters studied. F_3 testing for yield and visual-rating score of F_2 plant progenies appeared to be of little value in predicting F_4 and F_5 values, while early testing for lodging was only slightly more effective. When the genetic-variance component associated with differences between F_5 lines derived from an F_4 line was compared with other variance components, an indication was obtained that in general a relatively high degree of homozygosity was reached in the F_5 for the genes controlling all ten characters. Selection for differences among sister F_5 lines did not appear to have value as a means of securing advances in genotypic superiority.

1657 Nakagawa, M., Watanabe, M. & Watanabe, S.
(**On the new naked barley variety Nakatehadaka**).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. 3 : 175–78. [Japanese].

The above variety, registered as Norin 6 [Ministry of Agriculture and Forestry 6] was selected from Akashinriki [Red Shinriki] x Tokushimachinko 83. It is a productive variety resistant to mildew and *Gibberella saubinetii* and tolerant of acid soils.

1658 **Swan barley for Canada.**
What's New Crops Soils 1957 : **10** : No. 1 : p. 23.

This barley variety [cf. XXVII, 3880], is described as a smooth-awned, six-rowed variety, with yellow aleurone. It is resistant to stem rust and moderately resistant to spot and net blotch but susceptible to loose smut. It is of medium height and shows good lodging resistance and fair resistance to straw breaking and shattering.

1659 Bakhteyev, F. Kh. [Bahteev, F. H.]
A fossil form of cultivated barley: *Hordeum lagunculiforme* mihi.
Kungl. LantbrHögskolans Ann. 1957 : **23** : 309–14.

An account of work already summarized from another source [XXVII, 1768] is presented.

1660 Åberg, E.
Wild and cultivated barleys with pediceled florets.
Kungl. LantbrHögskolans Ann. 1957 : **23** : 315–22.

It is suggested that the pedicellate fossil grains described by Bahteev under the name *Hordeum laguncuIiforme* [XXVII, 1768] come from intermediate barley types with pedicellate lateral florets and sessile central florets, derived from crosses between two-rowed barley, in which the rudimentary lateral florets are pedicellate, and six-rowed barley, in which all the florets are sessile. Bahteev's material included many sessile grains and corresponds closely with that obtained from a number of lines of the above type of cross developed in the USA.

1661 Gotoh [Goto], K.
Genetic analysis of varietal differentiation in cereals. VI. Population structure of the barley variety, "Iwate Mensury No. 2".
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 75–82.

[Cf. XXVII, 3816].

1662 Sharma, A. K.
Chromosome studies in some Indian barley. I.
Proc. nat. Inst. Sci. India : Pt. B : 1956 : **22** : 246–54.

The strains IP1, IP9, IP13, IP14, IP20 and IP24 were examined by a technique involving, in the case of root-tip preparations, fixation in a mixture of 1% aqueous platinic chloride and 10% formalin in a proportion of 1 : 4, after pretreatment with colchicine at low temperature. All strains had $2n = 14$ chromosomes which were fairly similar in gross morphology. The strains were characterized by a high number of secondary constrictions, as follows: IP14, IP20 and IP24, 10 present in 3 pairs of chromosomes; IP1, 14 in 4 pairs; IP9, 16 in 4 pairs; and IP13, 8 distributed among 2 pairs. These observations are in contrast to those of other investigators, who have reported much lower numbers of secondary constrictions in *Hordeum vulgare.* Since high numbers of nucleoli were found in the strains, the possibility that the secondary constrictions are all nucleolar was not precluded. In IP9 the number of nucleoli was as high as 10. Meiosis was regular, except for the rare occurrence of inversion bridges in three strains. It is suggested that wild diploid species of *Hordeum* should be examined by the above-mentioned improved technique to discover whether they are characterized by high numbers of secondary constrictions, and thus obtain data useful in elucidating the course of evolution in the genus. It is also suggested that extensive hybridization should be carried out among varieties of *H. vulgare*, to study possible ring formation in order to establish a classification of the chromosome ends.

1663 Schooler, A. B.
The effects of fractionated doses of X-rays on dormant barley seeds.
Diss. Abstr. 1957 : **17** : Publ. No. 17,519 : 11–12.

The biological effects of continuous *vs.* fractionated doses of X rays on seeds of *Hordeum vulgare* 'Himalaya' were determined, measurements being made of symptoms of injury and frequencies of chromosome aberrations and mutations. Continuous exposures to 5000 r. and 15,000 r. were used, 12 fractionated treatments being applied at intervals of 30 min., 1 hr., 3 hr., 8 hr., 12 hr., 1 day, 2 days and 4 days. The number of fractionations included 2, 4 and 10 doses. The biological effects of the fractionated doses were additive. No process of recovery, such as restitution or reunion, therefore took place before germination. It is suggested that latent breaks may be produced by the passage of ionizing particles but that they do not become actual breaks until the metabolism of the seed becomes active.

1664 Gaul, H.
Zur Frage der ontogenetischen Elimination mutierter Zellen nach Röntgenbestrahlung von Samen. (**On the question of the ontogenetic elimination of mutant cells after X irradiation of seeds**).
Naturwissenschaften 1957 : **44** : p. 566.

Soaked barley seedlings were treated with 4000 r.; some of the seeds were given additional treatments before, during or after irradiation, with either CO_2, heat, colchicine or a combination of these. In all cases, it was found that the frequency of cells with chromosome bridges decreased with the duration of germination and the growth in length of the root, falling from about 24% for a 4 mm. root to 9% for a 20 mm. root. It is concluded that cells with gross chromosome mutations die away or are displaced from the tissue as growth proceeds.

1665 Adams, J. D.
Modification of X-ray effects in dormant barley seeds by post-treatments of oxygen and nitrogen.
Diss. Abstr. 1957 : **17** : Publ. No. 17,498 : p. 7.

Seeds of *Hordeum vulgare* 'Himalaya' were treated with 7500 r. and stored, together with nonirradiated seeds, in nitrogen, air and oxygen for 2–8 weeks. The effects of the postirradiation treatments on the following were determined: (1) frequency of chromosomal bridges and fragments, (2) percentages of germination, emergence in the field and mature plants, (3) height at the age of 2 weeks and (4) frequency of mutations in X_2 seedlings. Except in the case of (4), damage due to irradiation increased as the storage period became longer. Oxygen enhanced the effect of storage in air while nitrogen reduced this effect. Storage itself and oxygen concentration during storage had no effect upon (4). No correlation was found between visible chromosomal aberrations and X_2 seedling mutations. It is suggested that the influence of the oxygen treatment on chromosomal aberration is best interpreted on the basis of the latent-break hypothesis of both Lüning and Swanson or by an hypothesis assuming some secondary effect of X rays.

1666 GOERING, K. J., ESLICK, R. F. & RYAN, C. A. (JUN.)
Some effects of environment and variety on the amylose content of barley.
Cereal Chem. 1957 : **34** : 437–43.

The percentage of amylose in the starch of 44 varieties ranged from 13 to 24. The amylose content (19–23%) obtained from 30 samples of Compana was not affected to any marked degree by environmental factors or cultural practices. Glossy mutants of three varieties showed little or no difference from their normal counterparts in amylose content. Atlas 46 had an amylose content of 23%, as against 16% in the hooded form of this variety. The content in five "freaks" ranged from 11% in a form with a triple beard and two collars to 26% in a triple-bearded variant. This group of variants provides useful material for investigating the genetics of amylose content.

1667 ATKINS, R. E. & FREY, K. J.
Inheritance of awn barbing in two barley crosses.
Agron. J. 1957 : **49** : 558–60.

The semismooth awns of Bay behaved as a monofactorial dominant character in a cross of this variety with the smooth-awned selection Mich. 832–1188. Data on the progeny from the cross of Mich. 832–1188 with the rough-awned barley Kindred suggested that two dominant linked genes derived from the latter variety were necessary for the production of rough awns, plants with only one of these two genes in the dominant condition having semismooth awns and plants doubly recessive being completely smooth-awned. Mich. 732–1188 should be valuable as a parent in developing smooth-awned barleys; it is completely free of barbs from the base to the tip of the awn and is satisfactory in most agronomic characters.

1668 HAUS, T. E.
Inheritance of rachis internode length and an abnormal rachis type in barley.
Diss. Abstr. 1957 : **17** : Publ. No. 19,410 : 207–08.

Inheritance of the length of the rachis internode was determined from data on the F_2 and F_3 of Coast III x Accordian Rachis. The former barley is a six-rowed type with an average rachis-internode length of 3·9 mm., the latter a two-rowed type with an average length of over 7·0 mm. Segregation for length of rachis internode was explicable on the basis of a single major gene and modifiers; evidence of the effect of environment on this character was also obtained. Short rachis-internode was dominant over long. In Accordian Rachis, the rachis is pleated in a regular manner. Observations on this pleating were made in the F_3. The F_3 plants in some lines consisted of an intermediate type with only the lower 4 to 7 internodes pleated and an extreme type resembling Accordian Rachis. F_3 segregation for these two types was not explicable on a simple genetic basis. F_4 selections of normal, intermediate and extremely pleated plants were crossed with six-rowed and two-rowed barleys. In the F_1 normal rachis appeared to be completely dominant over both the intermediate and extremely pleated types. The F_2 generations are to be studied with respect to segregation for rachis type.

1669 BANASIK, O. J., MYHRE, D. & HARRIS, R. H.
A micro-malting method for nursery samples. Part II—method and comparisons with macro-malting and prediction procedures.
Brew. Dig. 1956 : **31** : 63–67.

Details are presented of a micromalting method requiring 60 g. grain and providing information on extract, diastatic power, α-amylase activity, wort/total nitrogen and nitrogen content. High correlations were found between values obtained by this method and those obtained by macro-malting. The method is expected to be of use in the analysis of early-generation hybrids. In breeding for high malting quality, the rejection of barleys which modify below 32% is recommended.

1670 Dwernicki, W.
Kryteria oceny wartości browarnej jęczmienia w hodowli roślin. **(Criteria for assessing the brewing quality of barley in plant breeding).**
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 477–87.

The evaluation of malting barley by using micro-malting tests for determining the amount of extract per unit weight of grain is recommended.

1671 Société d'encouragement de la culture des orges de brasserie et des houblons en France. Rapports sur les campagnes 1953 et 1955. **(Society for the promotion of the cultivation of brewing barleys and hops in France. Reports for the years 1953 and 1955):** Pp. 69 + 75.

The results of varietal trials conducted at thirteen centres throughout France are reported. Analyses of malting quality, including moisture, dry matter and protein content and hardness are included for each of the varieties tested. Weibull 5425 and a number of hybrids including Damseaux x Probstdorf have shown promise with respect to yield and quality. The results of the 1955 trials with established varieties resembled those of 1954 [cf. XXVII, 547].

1672 Fröier, K.
Åtgärder för att höja maltkornskvaliteten. **(Methods of improving the quality of malting barley).**
Sverig. Utsädesfören. Tidskr. 1957 : **67** : 271–91.

After an account of the characteristics required by the brewing industry, a survey of the more important malting barleys produced in Sweden and elsewhere since 1940 is presented. Mention is made of a promising variety, Sv50/102, bred at Svalöf from Morgenrot [Dawn Red] x Ymer, which combines good quality with high yield and desirable straw characters.

1673 Bell, G. D. H.
Grain quality—a genetic and plant-breeding character. 2. Barley.
Agric. Rev., Lond. 1957 : **3** : No. 7 : 10–20.

This examination of the problems of breeding for malting quality includes an account of the aims and procedures of improving malting barley at the Plant Breeding Institute, Cambridge, England. In addition to undergoing routine tests of normal germination behaviour, hybrid selections are subjected to germination tests immediately upon harvesting in order to estimate resistance to sprouting in the field and suitability for quick marketing and malting. Malting evaluations are carried out on grain samples of 60–80 g. by means of a technique devised by Whitmore. On the basis of their field characters and malting quality as indicated by Whitmore's test, Hybrids A and E, derived from Spratt-Archer and Freja, merit large-scale trial as possible improvements over Freja.

1674 Whitmore, E. T. & Sparrow, D. H. B.
Laboratory micro-malting technique.
J. Inst. Brew. 1957 : **63** : 397–98.

The following techniques of malting, kilning and mashing have been developed at the Plant Breeding Institute, Cambridge, England, where they have been successfully employed in testing the malting behaviour of hybrid barley selections. "Germination of a 30-g. sample steeped to 42–45% moisture is carried out in a test tube at 62° F. with occasional mixing to avoid matting. Kilning follows in an oven provided with a fan and is in three stages: 24 hr. at 122° F., 8 hr. at 140° F., and 16 hr. at 160° F. Mashing for extract determination is possible, using only a 5-g. sample of grist."

1675 Breitenfeld, C.
Genetische Untersuchungen zur Phylogenie und Systematik der *intermedium*- und *labile*-Gersten. **(Genetic investigations on the phylogeny and systematics of the *intermedium* and *labile* barleys).**
Z. Pflanzenz. 1957 : **38** : 275–312.

Attention is drawn to the confusion existing in the literature concerning this group of barleys, *Hordeum vulgare* convar. *labile* (Schiem.) Mansf., for instance, corresponding to *H. irregulare* Åberg et Wiebe. Crosses were made involving an Abyssinian barley of the *labile* type, two similar lines that had arisen by mutation after X-ray treatment, and a Tibetan barley belonging to convar. *intermedium*. In crosses of the *labile* forms with the two-rowed spring barley Donaria, from which the two mutants had arisen, the two-rowed character proved to be a simple dominant; however in crosses of the natural with the mutant forms the F_1 was in each case two-rowed and segregation roughly corresponding to a ratio of 9 : 7 occurred in the F_2; the *labile* character is thus determined by a different recessive gene in the natural and the mutant forms. The Tibetan barley of convar. *intermedium*, when crossed with the six-rowed winter barley Friedrichswerther Berg, gave progenies consisting entirely of six-rowed forms, showing that it carries the gene *v* and is potentially six-rowed; in crosses with Donaria it gave a two-rowed F_1, the dominance being incomplete in some plants; from this and the F_2 and F_3 results it is concluded that the *intermedium* character is influenced by two sets of genes, *vv* contributed by the Tibetan form and *ii* which is present in Donaria. Segregation also occurred in the F_1 between the Tibetan *intermedium* and the Abyssinian *labile* and the F_2 and F_3 results accord with the assumption that the Abyssinian form is recessive for *ii*, in addition to *ll*, for both of which the Tibetan form carries the corresponding dominant. Similar trihybrid ratios occurred in crosses of the Tibetan barley with the mutants; moreover the F_1 differed according to which of the two mutants was used, from which it is concluded that they carry different mutant genes; in both crosses a certain number of two-rowed plants occurred, showing that the mutant genes are distinct from *v* and they are therefore designated *s* and *c* respectively.

It seems probable that the Tibetan *intermedium* barley has arisen from a six-rowed barley by mutation of a gene determining awning of the lateral spikelets and it is given the genic formula *vvIILLSSCC*; the Abyssinian *labile* seems to have arisen by mutation of *L* to *l* in a two-rowed barley and has the formula $V^dV^diillSSCC$, thus differing from that referred to by Nötzel [cf. XXIII, 2669], which is recessive also for *vv* and must have arisen from a six-rowed form; that described by Covas [cf. XXII, 2700] seems to be different again since the gene that conditions it is one of the *Vv* alleles. The two mutant forms are different again; both carry V^d and *i* as in Donaria and their origin is ascribed to the mutation of two further genes, *S* and *C*, to their respective recessives; they are given the formulae $V^dV^diiLLssCC$ and $V^dV^diiLLSScc$ respectively. It is thought probable that the genes *L*, *S* and *C* here referred to correspond to the I series of Nötzel (*loc. cit.*).

The investigations make it clear that the *labile* group differs from convar. *intermedium* genetically as well as morphologically and geographically. A third series, *Myxosticha*, in the genus *Hordeum* is proposed to accommodate the *labile* group.

1676 TAKAHASHI, T.
(Yield estimation in malting barley).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 118–22. [Japanese].

The formula $Y = a + bN + cT$ is proposed for estimating yield. Y = yield per unit area, N = stem number per 30 cm. of row, T = mean temperature at the beginning of April, and a, b, c are varietal constants.

1677 TROFIMOVSKAJA, A. JA. & CEHANOVSKAJA, N. A.
(Biological bases of resistance to loose smut in barley).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 178–88. [Russian].

Observations are reported which show that conditions favouring growth rather than phasic development tend to cause the florets to open at flowering time, which in turn leads to greater attack by ergot and smut. This, it is thought, is the reason why certain varieties classed as smut resistant after artificial infection have proved susceptible in the field, as has been the case with the varieties Spartan and Maja. The behaviour of a variety under agricultural conditions should thus be taken into consideration in assessing its resistance.

Certain treatments, such as winter sowing, which increase the vitality of the seed and hence reduce infection by smut, are recommended.

1678 LUIG, N. H. & BAKER, E. P.
A note on a uredospore colour mutant in barley leaf rust, *Puccinia hordei* Otth.
Proc. Linn. Soc. NSW 1956 : **81** : 115–18.

One bright yellow pustule was noted among those infecting F_2 barley plants segregating for resistance to race UN14 of the above pathogen. Some other morphological differences between the mutant and the parent form were observed, together with some physiological differences but the mutant did not differ in pathogenicity.

1679 CLARK, R. V.
The evaluation of variability in pathogenicity of *Helminthosporium sativum* and the relation of temperature to disease development on barley.
Diss. Abstr. 1957 : **17** : Publ. No. 18,389 : 220–21.

The experiments referred to include the following. Using three barley varieties, variability in pathogenicity within three isolates of *H. sativum* (*Cochliobolus sativus*) was studied by comparing monoconidial cultures for three generations of subculturing. Comparative data on the development of seedling blight and root rot were obtained by calculating indices for seedling emergence. The mean square values for differences in pathogenicity between cultures were reduced with each generation of subculturing in the case of two isolates. The third showed a significant increase in variability and pathogenicity in the third generation. The first generation of each isolate varied in amount of pigmentation, production of aerial mycelium and growth rate; the variability was greatly reduced in the second and third generations. The decline in variability suggested that clones with similar nuclear constitution had been isolated in this heterocaryotic pathogen.

Variability within three monoconidial cultures was measured by subculturing about 125 single conidia from each culture. No significant differences in cultural characters were evident between the subcultures from each original clone. The pathogenicity of 20 of the subcultures taken at random from each clonal isolate was compared on two varieties of barley; no significant variation was found within two of the three isolates. The third clonal isolate, from the culture previously showing variation, exhibited significant differences in pathogenicity between subcultures; mutation may have occurred.

Investigations were also carried out on the influence of temperatures on the development of symptoms using six isolates of *C. sativus* and six varieties of barley. The behaviour of isolates and varieties varied according to the temperature.

1680 STERLING, J. D. E.
The status of barley jointworm after ten years.
Cereal News 1957 : **3** : No. 2 : 7–10.

Resistance to attack by *Harmolita hordei* has been found in a number of lines among 318 tested at Charlottetown, PEI, in 1952 but those lines showing a high degree of resistance were generally poor agronomically. Mianwali, N–C13–13 (USDA Composite 13) and Ch.4575–1 (Montcalm x Mianwali) are being used as sources of resistance and a back-cross programme is under way with the object of adding lodging resistance and the Jet type of resistance to *Ustilago nuda* to the last named selection. Some evidence has been obtained for the existence of several races of *H. hordei*.

1681 **Report of the Barley Committee of the European Brewery Convention. Trials 1956** : Pp. 110.

The spring barleys Kenia (standard), Busser, Carlsberg 11, Domen and Proctor were compared in 13 west European countries; details are given of field performance and of grain and malt properties. H. van Veldhuizen summarizes the results of the trials and F. R. Horne contributes the report of the Subcommittee on New Varieties.

1682 ZWEIFEL, J.
Les orges d'automne, les orges de printemps et les orges de brasserie. (**Autumn barley, spring barley and malting barley**).
Rev. rom. Agric. 1957 : **13** : 65–68.

In this review, the botanical and agronomic characteristics of spring and autumn barley are compared. The results of some recent Swiss trials with malting and forage varieties are summarized and discussed. Detailed data are provided on analyses of the grain from the varieties Isaria 1 and Ceresia.

1683 OUANG [WANG], T.-Y. & HUANG, T.-C.
(**Studies on the improvement of barley varieties. II. 1**).
Nung-lin-hsueh Pao/J. Agric. For., Taichung 1956 : **5** : 1–15. [Chinese].

Extensive data are provided on the agronomic and botanical characteristics and disease resistance of varieties under investigation in Taiwan. A list is also given of hybridizations that have been effected in order to produce forms better adapted to Taiwan conditions.

1684 MOËS, A.
L'action de la cystéamine chez l'orge. (**The action of cysteamine on barley**).
Bull. Inst. agron. Gembloux 1957 : **25** : 98–107.

In the variety Piroline, an application of cysteamine increased the rate of mutation caused by X-ray treatment and decreased the toxic effects of the irradiation. This chemical also affects germination and growth.

MILLETS AND SORGHUMS

1685 VARENICA, E. T.
(***Setaria***).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 9 : 33–34. [Russian].

Breeding work with *S. viridis* at Nemčinovka is reported. References are made to wide crossing, for instance with *Panicum*, and to large-grained early and productive forms thus obtained. A number of high-yielding grain and forage types were selected from Russian or Chinese material. The best among the grain types, Moscow 7, is still under trial. It outyields Egor'evskaja by 21·8%, is hardy and shows resistance to drought and smut. The large yellow grain has a starch content of 69·5–74·9% and 13·1–14·7% of protein and 8·8% of fat.

1686 Veyret, Y.
Les chromosomes somatiques chez quelques espèces de *Pennisetum*. **(The somatic chromosomes in some species of *Pennisetum*).**
Agron. trop., Nogent 1957 : **12** : 595–98.

Five species from the section *Penicillaria* were found to have $2n = 14$; the morphology of the chromosomes was similar for each species. *P. pedicellatum*, *P. subangustum* and *P. dichotomum* had $2n = 36$; the chromosomes of *P. dichotomum* were relatively large and *P. subangustum* had two satellites. *P. massaicum* appeared to be aneuploid with $2n = 34$; the chromosomes were small and one had a satellite.

1687 Jakuševskij, E. S.
(Varieties of grain and sweet sorghum selected at the Institute of Plant Industry).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : 25–31. [Russian].

The ten varieties described include a dwarf kaoliang variety 90–125 cm. high, resistant to drought and cold, giving good yields of grain with 73–77% of starch and 12–14% of protein; an early kaoliang ripening in 91–105 days, tolerant of poor soil and resistant to drought and smut; a dwarf durra, 70–90 cm. high, giving grain with 78–82% of starch, resistant to drought and moth; a sweet sorghum resistant to drought, cold and lodging, having 15–18% of sugars in the juice; and a sweet sorghum with waxy grains, containing 67–72% of starch, 12–15% of protein and 5% of oil, and a sugar content of 14–10% in the juice of the stems, which are low in HCN content.

The other varieties are selections from material obtained from the USA or Australia.

1688 Endrizzi, J. E.
Cytological studies of some species and hybrids in the Eu-sorghums.
Bot. Gaz. 1957 : **119** : 1–10.

Cytological studies have been carried out, at the Texas Agricultural Experiment Station, of the parents and progeny of the following crosses:—*S. vulgare* x *S. halepense*, *S. vulgare* x *S. almum*, *S. almum* x *S. halepense*, *S. vulgare* x *S. arundinaceum* and *S. vulgare* x *S. verticilliflorum*. Of these species *S. halepense* and *S. almum* have $2n = 40$, the remainder having $2n = 20$. Heterosis was observed in all crosses except *S. almum* x *S. halepense*. The following chromosome numbers were recorded in *S. vulgare* x *S. halepense*: one plant with $2n = 30$ and ten with $2n = 40$; and in *S. vulgare* x *S. almum*: one plant with $2n = 30$, two with $2n = 39$ and nine with $2n = 40$. It is concluded from studies of chromosome pairing in these two crosses that (*a*) one genome of *S. halepense* is similar to the genome of *S. vulgare*, (*b*) *S. halepense* arose as a segmental allopolyploid involving two genomes and its chromosomal complement now consists predominantly of one genome, similar to that of *S. vulgare*, (*c*) *S. almum* is a segregate from a cross between *S. vulgare* and *S. halepense* and (*d*) most of the genetic complement of *S. almum* is composed of "chromosome segments of *S. vulgare*".

1689 Mazurin, S. A. & Mil'man, G. B.
[Džugara (grain sorghum)—a valuable forage plant].
Zemledelie (Agriculture) 1957 : No. 12 : p. 88. [Russian].

Mention is made of some Uzbek land varieties of the above type, in particular of Katta-Boš which ripens late and produces 40–45 c. grain and up to 800 c. of green matter per ha. A new variety was obtained in Uzbekistan by crossing the local variety Horaki with a local broom sorghum. It has a growth period of 145 days and stems 4 m. tall with a sugar content of 13–14%. The panicle is compact, drooping and with large grain. It yields 50–60 c. grain and 910 c. green matter per ha. from two cuts made possible by early sowing.

1690 Mikula, B. C.
Variation in *Sorghum vulgare* var. *drummondii* (Steud.) Chiov.
Diss. Abstr. 1957 : **17** : Publ. No. 17,194 : 23–24.

From an analysis of the morphological variation of weed sorghums in the valleys of the Ohio, Wabash, Illinois and upper Mississippi rivers it is concluded that they originated as hybrid complexes involving the syrup and broom sorghums.

RICE

1691 Sung, C.-H.
(A study of sampling technique in rice field trials).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 170–84. [Chinese].

An analysis of a uniformity trial with the variety Taichung 65 is reported. Population variates were normal for *n* as low as 10. Long narrow plots parallel to the soil fertility gradient had the smallest errors. Blocks were most effective when square and at right angles to the fertility gradient. The most suitable number of replications was 6–7. The most efficient use of land results from decreasing plot areas to not less than 14 x 0·7 chih* and increasing the number of replications.

1692 L.V.V. in 1956. **(The Department of Agriculture, Livestock and Fisheries in 1956).**
Surinaam. Landb. 1957 : **5** : Pp. 87.

In addition to the work on rice described below, varietal and clonal trials of groundnut, cacao and oil palm are in progress.

Rice. The new line VD5096/73 is likely to prove of greater value to the small farmer than Dima, since it gives a dense cover more rapidly and appears to be more resistant to leaf diseases. From crosses of Dima with the large-grained variety Géant [Giant], lines with smooth leaves and smooth grains resulting in less wear and tear of threshing equipment have been obtained.

1693 Jodon, N. E.
Inheritance of some of the more striking characters in rice.
J. Hered. 1957 : **48** : 181–92.

A detailed genetical study has been carried out of the following new or recently reported characters: (1) early prolific long glume, *Gl*, (2) long lemma, *lmx*, (3) white hull, *HwHg*, (4) yellow hull, *Hwhg*, (5) black leaf, *lk*, (6) neck leaf, *nk*, and (7) dwarf, d_x. Four of the genes, *lmx*, *lk*, *nk* and d_x, are simple recessives; long glume is controlled by a single gene lacking dominance and white hull, *Hw*, is epistatic to straw hull, *Hg*, but only partially obscures gold hull, *hg*, the combination *Hwhg* resulting in the yellow-hull phenotype.

Linkage studies indicate that *Hw* is associated with liguleless *lg*, in group V, with 8% crossing over, and with a gene for apiculus colour, Ap_b, in group II with 36% crossing over, indicating that the genes originally associated with these two groups are on the same chromosome. No definite indication of linkage was obtained for any of the five other genes tested but additional data were obtained on the linkage of Ap_a–*wx* and Ap_a–*Scl* in group I and Ap_b–*hg* in group II.

1694 Nagao, S. & Takahashi, M.
Genetical studies on rice plants. XIX. The third gene in apiculus coloration.
Jap. J. Bot. 1956 : **15** : 141–51.

The authors had originally proposed a dimeric scheme (loci *C Sp*) to account for apiculus pigmentation [cf. XXIII, 2707]. However, trimeric segregation ratios have been reported by other investigators and have now been confirmed by the present authors. An additional locus, *A*, is therefore inferred. *C* is the gene responsible for chromogen production in general, *Sp* converts chromogen to anthocyanin, while *A* is responsible for pigment production in the apiculus in particular. Some evidence for linkage between *A* and *Pl* with a recombination value of *ca.* 3% was obtained.

1695 Nagao, S., Takahashi, M. & Miyamoto, T.
Genetical studies on rice plant, XXI. Biochemical studies on red rice pigmentation.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 124–28.

Red pigmentation in the grains of rice varieties of genetic constitution *RcRd* (red) or *Rcrd* (brown) was shown to result from a mixture of catechin, catechol tannin and phlobaphene. Red grains contained more of the first two compounds than brown grains.

1696 Oka, H.-I.
Phylogenetic differentiation of cultivated rice. XV. Complementary lethal genes in rice.
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 83–87.

Two types of complementary lethality are described. In the first, in which dominant complementary genes are involved, the F_1 plants turn yellow and die except under exceptionally favourable conditions. One of the complementary genes occurs in the Indian variety PTB10, the other in a number of Continental varieties. In the second type, the F_1 hybrids are viable but lethal plants segregate in the F_2. The segregation ratios could be explained on the assumption of recessive complementary genes. One of the genes occurs in the Indian variety Surjamukhi, the other in the Japanese variety Kisshin.

1697 Oka, H.
(The tendency of characters to associate in lines derived from the progenies of rice hybrids. Phylogenetic differentiation of cultivated rice. XVI).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 1–6. [Japanese].

The association between resistance to $KClO_3$, low temperature and drought, length of germination period, grain weight at shedding, length/width ratio of the grain, length of apiculus hairs, awn length, response of endosperm to alkali treatment and phenol reaction was studied in randomly selected F_6 lines of hybrids between 70a Som Cau, Pai-ko [White Husk], PTB 10, Kinoshita glutinous rice and Taichung 65. It was found that parental character-combinations occurred more frequently than recombinations on the assumption that recombination was unrestricted. These studies therefore suggest that recombination restrictions are operative [cf. XXVII, 3011].

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* 1 chih = 14·1 inches = 35·81 cm.

1698 OKA, H.
(Hybrid sterility and hybrid vigour in crosses between lines derived from hybrids between distantly related varieties of rice and the parental varieties. Phylogenetic differentiation of cultivated rice. XVII).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 7–11. [Japanese].

F_7 and F_8 lines from the crosses alluded to in the previous abstract were crossed to the parental varieties and to other varieties used as testers. The degree of hybrid sterility in the set of test combinations varied with the line but most lines resembled one or other of the parents in this respect. Lines giving fertile hybrids with one parent tended to produce semi-sterile hybrids with the other. Lines resembling one parent in the degree of sterility of the test combinations tended to produce heterotic offspring with the other parent. These results are discussed in the light of the author's theory of gametic development genes.

1699 ADACHI, T. & HAGA, T.
(On the new rice variety Bizennishiki).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 187–89. [Japanese].

A description is given of the above variety (= Norin 63 [Ministry of Agriculture and Forestry 63]), a selection of Tosan x Kinki 15. Its salient characteristics are resistance to *Xanthomonas oryzae* and lodging.

1700 ADACHI, T. & HAGA, T.
(On the new rice variety Homasari).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 191–94. [Japanese].

The above variety (= Norin 64 [Ministry of Agriculture and Forestry 64]) is described. It was selected from the progeny of Tosan 37 x Tosan 36; it is an early variety with some resistance to *Piricularia oryzae* and other diseases.

1701 ADACHI, T., HAGA, T., WADA, T., MARUYAMA, S. & SATOKAWA, O.
(On the new rice variety Hokiasahi).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 195–98. [Japanese].

A description is given of the above variety, registered as Norin 77 [Ministry of Agriculture and Forestry 77]. It was selected from the cross Shigaasahi 27 [Shiga Rising Sun 27] x Tosan 36. It is a high-yielding blast-resistant variety adapted to conditions in the prefecture of Tottori.

1702 ADACHI, T., HAGA, T., WADA, T., MARUYAMA, S. & SATOKAWA, O.
(On the new rice variety Tsubasa).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 199–202. [Japanese].

This variety, a selection of Sembonasahi x Norin 8 [Ministry of Agriculture and Forestry 8], has been registered as Norin 78. It is a midseason rice with some resistance to *Piricularia oryzae*.

1703 ADACHI, T., HAGA, T., WADA, T., MARUYAMA, S. & SATOKAWA, O.
(On the new variety Akibae).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 203–06. [Japanese].

Registered as Norin 79 [Ministry of Agriculture and Forestry 79], this variety, a selection of Futaba x Rikuu 132, is an early rice recommended for mountainous areas.

1704 ADACHI, T., HAGA, T., WADA, T., MARUYAMA, S. & SATOKAWA, O.
(On the new rice variety Akebono).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 207–10. [Japanese].

The above variety, registered as Norin 80 [Ministry of Agriculture and Forestry 80], was selected from Norin 12 x Asahi [Rising Sun]. It yields well on fertile soils.

1705 MARUYAMA, A. *ET AL.*
(On the new rice variety Sachiwatari).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 211–14. [Japanese].

A full description is given [cf. XXVI, 2388].

1706 Portères, R.
Les variétés de riz de l'Ile du Kabak (Guinée française). [**The varieties of rice in the Isle of Kabak (French Guinea)**].
J. Agric. trop. Bot. appl. 1957 : **4** : 185–211.

Varieties which have been cultivated in the XIXth and XXth centuries are mentioned; recent varieties and races are described in detail and a morphological classification is provided.

1707 Hu, C.-H.
(**Caryological studies of haploid rice plants. I. Chromosome association at meiosis**).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 28–36. [Japanese].

[Cf. XXVII, 3810].

1708 Oka, H. & Lu, Y.-C.
(**The response to temperature of tillering, culm length and ear length in rice and varietal differences in this respect**).
Nung-lin-hsueh Pao/J. Agric. For. Taichung 1955 : **4** : 1–18. [Chinese].

The response of a series of Far Eastern varieties to a temperature range of 18–28° C. was investigated. Tillering rate rises with temperature, this rise being generally greater in Continental than in Insular varieties. Tillering period and final number of tillers, however, decrease with rise in temperature, the decrease being less with Continental varieties. Rate of culm elongation rises with temperature; this rise is more marked in the Continental varieties. Final culm and ear lengths in varieties insensitive to photoperiod are negatively correlated with temperature in the early stage of development but positively at the stage of internode elongation. The initial negative correlation is higher in Insular varieties; the later positive correlation is higher in Continental varieties. The bearing of these findings on breeding for yield under tropical conditions is discussed.

1709 Oka, H.
(**On hybrid sterility in intervarietal crosses of rice**).
Nogyo oyobi Engei/Agric. & Hort. 1956 : **31** : 9–14. [Japanese].

The genetical basis of intervarietal sterility is reviewed, considering data already published. The original papers have been summarized *passim* in *Plant Breeding Abstracts*.

1710 Tepora, J. N. & Umali, D. N.
FB-24, a "runner" type variety of rice.
Philipp. Agric. 1957 : **41** : 191–93.

At the Central Experiment Station in Laguna, the lowland variety FB24 produced vigorous shoots at the nodes of stalks left after the main crop was harvested. The heading of these shoots started at the same time as that of the basal tillers.

1711 Piacco, R.
Dal Lady Wright alla stirpe 82 Chiappelli. (**From Lady Wright to Chiappelli strain 82**).
Riso, Milano 1957 : **6** : No. 8 : 8–10.

The breeding of rice varieties with long, slender grain classed as "fine" started in Italy with the introduction of the variety Lady Wright from the USA in 1925 and the present note traces the production from it of a series of selections and hybrids, not only at the rice research station at Vercelli but also at Bologna and elsewhere; the best of these is considered to be strain 82, which has a length : breadth ratio of 2·9, with an average grain length of 10·05 mm.; its yield is described as normal and it is highly resistant to lodging and disease.

1712 Inosaka, M.
(**On varietal differences in changes in the growing point of rice during development**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 212–13. [Japanese].

Three Japanese varieties showed differences in the variation with time of the ratio width of the growing point/number of cells.

1713 Alim, A. & Sen, J. L.
Inter-relationship of some plant characters with the yield of spring paddy (boro).
Pakist. J. sci. Res. 1957 : **9** : 54–57.

At the Deep Water Paddy Research Station, Habiganj (Sylhet), the yield of spring paddy was found to be correlated positively with the number of tillers per plant and the length of the panicle, while the latter character was positively associated with the number of grains per panicle and all three characters were collectively associated with yield.

1714 Duarte, A. J. S.
Sobre algumas correlações no arroz. (**Some correlations in rice**).
Agron. lusit. 1957 : **19** : 31–56.

Various correlations reported in the literature are referred to and the author's own observations are reported. In *Oryza sativa* 'Chinês' [Chinese] and 'Ponta Rubra' [Red Tip], plant height was found to be correlated positively with number of spikelets per plant, number of panicles per plant, number of spikelets per panicle and yield and negatively with percentage of empty florets; number of spikelets per plant was correlated negatively with weight of 100 spikelets and positively with number of panicles and number of spikelets per panicle; weight of 100 spikelets was correlated negatively with percentage of empty florets and number of spikelets per panicle; percentage of empty florets was correlated negatively with number of spikelets; yield was correlated positively with number of spikelets per plant and per panicle and with number of panicles per plant, and negatively with percentage of empty florets. Some of the correlation coefficients were higher in respect of one cultivar than the other and varied, though to a lesser degree, from one line to another within a cultivar; in general, the correlations tended to be higher in Chinês, which in the region of Portugal where the experiments were performed is later and more productive, than in Ponta Rubra.

The highest coefficients of correlation were those between yield and total number of spikelets per plant but as this number involves rather more labour in counting it is thought that the total weight of spikelets per plant is a more suitable value to determine for breeding purposes. Only in those lines or individuals selected on this basis will it be necessary to determine other characters such as number of spikelets per panicle and percentage of empty florets, as well as number of tillers bearing panicles and height of plant. In comparing lines in advanced generations of selection, comparisons are made of total weight of spikelets, weight of cleaned grain, number of panicles and height. Weight of 100 grains need not be considered as it is not strongly correlated with yield.

1715 TANAKA, M.
(Towada and Oirase, new means of withstanding cold injury to rice).
Nogyo oyobi Engei/Agric. & Hort. 1956 : **31** : 473–75. [Japanese].

A description is given of the agronomic performance of Towada (= Fu 36), a selection of Fujisaka 17 x Fujisaka 3. This variety is believed to be promising as a cold-resistant rice for the prefecture of Aomori. Brief mention is also made of the agronomic performance of Oirase (= Fu 37) and the Fu lines 38 and 39.

1716 OKA, H. I. & RU [LU], Y. C.
Studies of drought resistance in rice varieties.
Chung-hua Nung-hsueh Hui Pao/J. agric. Ass. China 1957 : No. 18 : 7–17.

Three types of drought resistance are distinguished: (1) ability to live through severe drought, (2) ability to continue vegetative growth under conditions of limited water supply, and (3) delay of flower initiation during conditions of inadequate water supply. The three categories are independent; (1) is exemplified principally by Continental varieties, (2) by upland varieties and (3) by some Continental and Tropical-Insular forms.

1717 GOTŌ, Y. & TAI, K.
On the differences of oxidizing power of paddy rice seedling roots among some varieties.
Soil & Pl. Food, Tokyo 1957 : **2** : 198–200.

The capacity for oxidizing esculin shown by the roots of 13 Japanese varieties was determined. Oxidizing capacity and resistance to autumn decline were positively correlated.

1718 TAKAHASHI, Y.
(The mechanism of resistance to rice blast. II. Morphological changes in infected cells of blast-resistant varieties).
Yamagata Daigaku Kiyo (Nogaku)/Bull. Yamagata Univ. (Agric. Sci.) 1956 : **2** : 83–90. [Japanese].

Resistance is usually associated with granule formation within infected cells; hyphal growth is least in cells with colourless granules and is much reduced, though to a lesser extent, in cells with dark granules. If the host tissues are heated to 100° C. for 30 minutes, hyphae grow as well in the cells of varieties normally resistant as in those of susceptible forms. However, dark granules may still be formed.

1719 OKA, H.-I. & LIN, K.-M.
Genic analysis of resistance to blast disease in rice. (By biometrical genetic method).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 20–27.

The inheritance of blast resistance was studied in F_1–F_3 populations of Pei-ku (Continental) x Taichung 65 (Temperate Insular) subjected to severe natural infection in Taiwan. Using Mather's partitioning method, the number of effective factors governing resistance was calculated as one; susceptibility (*Bt*) is dominant. *Bt* appears to be linked with gamete-development genes, on account of which its segregation ratios are disturbed, and with *Ph ph*, for phenol reaction. The recombination value between *Bt* and *Ph* is *ca.* 0·4.

1720 Reyes, G. M.
Rice dwarf disease in the Philippines.
Plant Prot. Bull. 1957 : **6** : 17–19.

Nine local varieties of rice were inoculated with the rice-dwarf virus; Milketan 20 appeared to be the most resistant.

1721 **Discover dread 'Hoja Blanca' disease in Florida rice plots.**
Rice J. 1957 : **60** : No. 11 : 10–11.

White leaf, a disease probably caused by a virus, has been discovered for the first time in the USA, at Belle Glade, Fla. The USDA world collection is being tested for resistance in infected areas in Cuba and Venezuela. So far some 285 lines of short and medium grained rice with appreciable resistance have been found, mostly comprising introductions from Japan, China and Taiwan. Use will be made of these to introduce resistance into commercial varieties of the USA. So far no resistant varieties of the long-grained type have been discovered.

1722 Rayappa Pillai, M., Shanmughasundaram, A., Srayankumaran, & Nargunam, W. R.
Paddy strains for the east coast districts.
Madras agric. J. 1957 : **44** : 289–95.

A summary is given of trials carried out during 1950–56 at the Palur Station, Madras State, to study rice strains developed locally and at other stations in India. Strains best suited to the different seasons in the above districts are indicated.

1723 Tang, S.-H., Liu, J.-S., Yu, L.-T., Wu, K.-N. & Tsun [Chung], C.-K.
Studies on the vernalization of rice.
Sci. sin. 1956 : **5** : 475–96.

Data are provided on the optimum temperature and duration of vernalization for a series of Chinese varieties.

FORAGE GRASSES

1724 Hiepko, G.
Die Methoden der Sortenprüfung bei Futterpflanzen in Grossbritannien. **(The methods of variety testing of forage plants in Great Britain).**
Z. Pflanzenz. 1957 : **38** : 357–82.

Procedures used for variety testing in England, Wales, Scotland and Northern Ireland are described and compared. English forage-crop breeding in relation to the ley-farming system is discussed.

1725 Schechtner, G.
Sorten- und Provenienzprüfungen bei Gräsern, Klee und Luzerne 1954–1956. **(Variety and provenance testing with grasses, clover and lucerne, 1954-56).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1957 : No. 40 : Pp. 50. (Mimeographed).

The results are reported of trials with ten grass species, white and red clover, *Trifolium hybridum*, lucerne, *Medicago lupulina* and *Lotus corniculatus*; most of the varieties tested came from European countries.

1726 Corkill, L.
Pasture plant breeding in New Zealand.
Agric. Rev., Lond. 1957 : **3** : No. **6** : 31–37.

In this account of the role of seed certification and breeding in grassland farming in New Zealand, a detailed description of the methods used in improving perennial ryegrass is given as an illustration of the general procedure employed in the present policy of breeding strains with wide rather than regional adaptability. Crosses were made with the purpose of incorporating the early spring growth, late flowering, high palatability and leaf-rust resistance of the short-rotation ryegrass H1 in perennial ryegrass, and strain building has been based on the polycross technique. This project has now reached the stage of testing third-generation progenies from the second polycross. Special methods are being applied in the case of other objectives, such as development of a white-clover strain similar to the present certified strain but homozygous for a conspicuous leaf marking inherited as a simple dominant character, crossing between *Lolium* and *Festuca*, and induction of tetraploidy in red clover and *Lotus*.

1727 Ballard, F.
Ecology of grasslands.
Nature, Lond. 1957 : **180** : 1173–75.

Papers read at a joint session held by the Botany and Agriculture Sections of the British Association on the above topic at Dublin, 11 September 1957, are summarized. They included a contribution on Genetical and ecological variation of the components of grasslands in the British Isles by C. E. Hubbard. After surveying types of variants and drawing distinctions between those of genetical and ecological significance, he considered the question of self and cross fertility. It was pointed out that most annuals are self fertile, whereas many perennials are cross-pollinated and often self sterile. Annuals, as might be expected, tend to have fewer outstanding variants. The polymorphism seen in perennials may arise from intraspecific cross pollination, interspecific hybridization and intergeneric crossing. The outstanding polymorphism of *Molinia coerulea* is probably due to ancient hybridization; cytological investigation of this species is required. Of the nine intergeneric hybrids known in the British Isles, only one, *Festulolium loliaceum*, is widely distributed. Attention was also drawn to polyploidy as a cause of variation, as in *Holcus mollis*, and to the possible role of apomixis in producing variability in *Poa pratensis* in Great Britain and in species of such genera as *Calamagrostis*, *Deschampsia*, *Sieglingia* and *Puccinellia*. The paper concluded with an outline of the possible development of natural grassland in the British Isles since the last Ice Age. The view was expressed that the desirability of replacing indigenous strains, which have been selected naturally for a long period, by a limited number of bred strains, is debatable. The preservation of native strains in as many regions as possible for the purpose of future selection is advocated.

1728 Svalöfs nya grässorter för Norrland har väl hävdat sin överlägsenhet. **(The new Svalöf grass varieties for Norrland have maintained their superiority).**
Allmänna Svenska Utsädesaktiebolaget, Svalöf (General Swedish Seed Co. Ltd., Svalöf) 1958 : 37–39.

The timothy variety Bottnia II [cf. XXV, 2059] has continued to do well in northern Sweden. A recently developed meadow fescue, also named Bottnia II, selected from a Norrland land race, has proved high yielding, leafy and resistant to overwintering fungi.

1729 Caputa, J. & Badoux, S.
Observations sur le comportement d'écotypes du trèfle violet (*Trifolium pratense* L.), du dactyle (*Dactylis glomerata* L.) et du fromental (*Arrhenatherum elatius* M. et K.). **[Observations on the behaviour of ecotypes of red clover (*T. pratense* L.), cocksfoot (*D. glomerata* L). and *A. elatius* M. and K.].**
Landw. Jb. Schweiz 1957 : **71** : 755–74.

Natural meadows in French-speaking Switzerland were found to contain a wide range of types of the above plants; some cocksfoot and *Arrhenatherum* ecotypes have desirable agronomic characters. The red clovers are mostly early plants of low productivity; some types, with a faculty for rapid regeneration, may be of use in breeding varieties adapted to Alpine conditions.

1730 Internationales Symposium über Fragen der Züchtung polyploider Futterpflanzen. **(International symposium on questions of breeding polyploid fodder plants).**
Dtsch. Landw., Berl. 1957 : **8** : 532–34.

Short summaries are presented of papers read at a symposium held in July 1957 at the Plant Breeding Institute of Gross-Lüsewitz.

Julén dealt with factors hindering seed production in tetraploid red clover, such as the small attraction the flowers have for bees and the irregularities of chromosome number, which lead to abortion of the embryos. These tetraploids give high yields of fodder and are resistant to *Sclerotinia trifoliorum* and nematodes.

It was reported by Hertsch that the amount of seed set by polyploid forage crops increases with succeeding generations; his own material has shown considerable variability in this respect and good seed producers can be selected. Selfing in polyploid *Lolium multiflorum* and *Festuca pratensis* led to a higher seed production than is found in diploid forms; it was considered unlikely that self-fertile tetraploid red clover could be produced. The different modes of segregation found in $2n$ and $4n$ forms of clover were mentioned by Focke and he discussed the use of self-fertile plants in breeding for increased yield.

According to Hagberg, crosses between tetraploid *Brassica oleracea* and *B. campestris* var. *rapifera* gave promising and fertile lines of swede; corresponding crosses with *B. napus* surpassed the best Swedish rape varieties in respect of winter hardiness and yield. The high degree of heterosis possible with tetrasomic inheritance and the sterility barriers between $2n$ and $4n$ forms of cultivated plants were discussed.

Hulewicz found that in drought resistance and yield, tetraploid red clover surpassed diploid forms; tetraploid *Ornithopus sativus* was also more drought resistant than the diploid but gave higher yields only when grown with rye. The long corolla tube of the $4n$ clover hinders insect pollination; selfing resulted in seed production in 20% of the tetraploids and 3·2% of the diploids. Schweiger discussed heterosis in tetraploid clover.

Polyploids of *Dactylis glomerata* and *Arrhenatherum elatius* were inferior to the normal forms according to Zimmermann who suspects that these genera are already tetraploid.

Ellerström has studied the performance of races of *Phleum pratense* with 42, 56 and 70 chromosomes; plants with lower chromosome numbers did well in southern Sweden and the higher polyploids were more suited to northern districts, with higher rainfall and longer days. It was recommended that different autotetraploid types should be crossed, followed by selection from the heterozygous progenies after a few years' cultivation in different districts; in this way types adapted to various conditions might be obtained through heterosis or the accumulation of valuable genes.

In a discussion on the physiological problems of polyploid breeding, Bellmann compared the water requirements and the effect of irrigation on yield in diploid and tetraploid clover. Sachs confirmed that tetraploids produced less vegetation in dry districts than diploids but he pointed out that the seed production of the tetraploids is higher under these conditions.

The F_1 and F_2 polyploid clones from the cross *Bryophyllum crenatum* x *B. daigremontianum* were reported by Schwanitz to be inferior in general performance to the diploid progenitors; this was attributed to a deficiency of growth hormone. The heterosis effect appeared to be greater in the F_2 than in the F_1.

Reimann-Philipp mentioned some particular uses of polyploid breeding such as the production of fertile interspecific hybrids and increasing the uniformity of a variety. In his concluding speech, Schick reviewed the improvements in fodder plants made possible by polyploid breeding.

1731 HULEWICZ, D.

Eine neue Methode zur Colchicinbehandlung der Gräser. (**A new method of colchicine treatment for grasses**).

Züchter 1957 : **27** : 299–300.

Germinating seeds are placed in Petri dishes with 1·3% agar + 50% Knop's solution. When the coleoptiles are 1·5 cm. long, they are cut off just above the growing point and the dishes are filled with colchicine solution; placing the dishes in a desiccator from which the air is removed ensures that the solution adheres to the tissues. The required strength of solution and duration of treatment varies for each genus; *Phalaris arundinacea* produced many polyploid cells after 45 min. treatment but *Festuca pratensis* required a 4 hr. treatment; the solutions were between 0·2 and 0·4%. To identify the polyploids, preparations of the meristematic tissue at the base of the shoot were used.

1732 BROWN, W. V. & EMERY, W. H. P.

Some South African apomictic grasses.

J. S. Afr. Bot. 1957 : **23** : 123–25.

Species of which apomictic representatives have been found are listed. The 25 species referred to belong to the following genera: *Bothriochloa, Dichanthium, Heteropogon, Hyparrhenia, Themeda, Anthephora, Brachiaria, Panicum, Pennisetum, Tricholaena, Urochloa, Chloris, Fingerhuthia* and *Eragrostis*. In *F. africana* and the three species of *Eragrostis* studied apomixis was possibly of the diplosporous type. The remaining species were aposporous. All the species had 4-nucleate embryo sacs.

1733 LACKAMP, J. W.

Data from recent research in animal nutrition, important for breeders of fodder plants.

Euphytica, Wageningen 1957 : **6** : 142–48.

The problems of designing breeding projects suited to the requirements of livestock nutrition are discussed. The points made include the suggestion that selection for higher protein content should be confined to crops grown primarily for this nutrient, since in low-protein crops such as cereals and potato an increase in protein content is concomitant with a relatively much greater increase in starch yield. A discussion is given of pig-feeding trials carried out by N. J. Dammers, indicating that the protein content of barley meal was of little importance in influencing gain in weight. If this finding is confirmed, breeding barley for animal feeding and for brewing would not be divergent aims. The author also discusses digestibility experiments carried out by N. D. Dijkstra on sheep, showing that chemically-determined protein contents of different grass species were in fact a measure of feeding value.

1734 TATEOKA, T.

(**Miscellaneous papers on the phylogenetic classification of the Gramineae. I, II, III, IV, V, VI, VII**).

Shokubutsu Kenkyu Zasshi/J. Jap. Bot. 1956 : **31** : 1–5; 84–90; 179–86; 241–48; 267–72; 307–15; 353–58. [Japanese].

Taxonomic reviews are presented of the subfamilies Festucoideae, Eragrostoideae and Panicoideae. The characteristics chiefly studied were leaf anatomy, chromosome size and number and geographical distribution. It is proposed that a new group, the Eufestuciformes, should be established including the Festucoideae, Triticeae and Monermeae. This group is believed to be monophyletic with a centre of origin in the Mediterranean region; it is characterized by a basic chromosome number of $x = 7$, large chromosome size and a distinctive leaf structure.

1735 Tateoka, T.
(Miscellaneous papers on the phylogenetic classification of the Gramineae. VIII).
Shokubutsu Kenkyu Zasshi/J. Jap. Bot. 1957 : **32** : 11–17. [Japanese].

The taxonomic status of the subfamily Andropogonoideae is reviewed, with special emphasis on chromosome number and size and on leaf anatomy. The Andropogoneae and Maydeae are included in the subfamily but the Paniceae are excluded.

1736 Tateoka, T.
(Miscellaneous papers on the phylogenetic classification of the Gramineae. IX).
Shokubutsu Kenkyu Zasshi/J. Jap. Bot. 1957 : **32** : 42–49. [Japanese].

Following along the lines of the earlier papers in this series, the author briefly reviews the Micrairoideae, Anomochloideae, Oryzoideae, Olyroideae and Bambusoideae.

1737 Brown, W. V. & Emery, W. H. P.
Persistent nucleoli and grass systematics.
Amer. J. Bot. 1957 : **44** : 585–90.

Investigation of the root tips of 45 species representing 39 genera and 20 tribes in the Gramineae suggested that the character of persistence of the nucleoli during mitosis is of taxonomic value. Members of the Panicoideae had persistent nucleoli in at least some cells of every root tip examined, whereas among members of the Festucoideae no persistent nucleoli were found in any of the cells. Persistent nucleoli were observed in some species in the group designated Phragmitiformes by Avdulov but not in others.

1738 Brown, W. V., Heimsch, C. & Emery, W. H. P.
The organization of the grass shoot apex and systematics.
Amer. J. Bot. 1957 : **44** : 590–95.

Examination of 63 species belonging to 50 genera and 21 tribes revealed that the number of tunica layers may be of systematic significance. Two such layers were usually present in members of the Festucoideae whereas a single layer was most common among the Panicoideae. Two tunica layers were found in all of the ten members of the Phragmitiformes studied, except in *Danthonia spicata*.

1739 Row, H. C. & Reeder, J. R.
Root-hair development as evidence of relationships among genera of Gramineae.
Amer. J. Bot. 1957 : **44** : 596–601.

Root-hair development was investigated in the germinating seeds of 82 species representing 68 genera and 11 tribes. Size of epidermal cells was more reliable as a taxonomic criterion than position or angle of the root hair. Alternation of long and short cells, with only the latter producing root hairs, is a festucoid character, whereas the occurrence of equal-sized cells, any one of which may produce a hair, is a panicoid feature. Data on root-hair development agree with the taxonomical suggestions made by previous investigators on the basis of embryo structure, leaf anatomy and chromosome number and size. The heterogeneity of the Festuceae and Agrostideae is thus further emphasized, as well as the affinity of the Chlorideae and Zoysieae to the Panicoideae rather than to the Festucoideae.

1740 Milinkovic, V.
Accessory chromosomes in the roots of *Poa alpina*.
Hereditas, Lund 1957 : **43** : 583–88.

Plants of *P. alpina* known to possess accessories as a normal component of the chromosome complement of the pollen mother cells were examined for accessories in the root tips, at the Institute of Plant Breeding and Genetics, College of Agriculture, Zagreb. Accessories were found in all primary roots, regardless of their length. Accessories were however absent in the adventitious roots, whether very young and short or long. Young primordia of adventitious roots in the interior of the tillers also lacked accessories.

1741 Nygren, A.
***Poa timoleontis* Heldr., a new diploid species of the section *Bolbophorum* A. & Gr. with accessory chromosomes only in the meiosis.**
Kungl. LantbrHögskolans Ann. 1957 : **23** : 489–95.

Root-tip mitosis in a single plant of the above species from Macedonia showed $2n = 14$, but at meiosis two supernumerary chromosomes which usually underwent normal distribution were observed. During first pollen mitosis both accessories went to one pole. In both *P. timoleontis* and *P. alpina* var. *xerophila*, which also has two accessories [cf. XXVI, 1340], the accessory bivalents at pachytene have two large heterochromatic blocks. On the basis of this and other similarities it is suggested that the accessories in the two species may be related.

1742 NYÁRÁDY, A.

Studii asupra biologiei gramineelor, cu considerații speciale asupra înmulțirii vegetative a speciei *Poa annua* L. și a altor cîtorva Graminee. (**Studies on the biology of the Gramineae with special reference to vegetative propagation in the species *Poa annua* L. and in some other Gramineae**).

Anu. Lucr. ști., Cluj 1957 : **13** : 225–39.

Plants of *P. annua* reproducing by stolons have been discovered among populations of this species at Cluj and elsewhere in Rumania. The characteristic is believed to be hereditary.

1743 NORDENSKIÖLD, H.

Segregation ratios in progenies of hybrids between natural and synthesized *Phleum pratense*.

Hereditas, Lund 1957 : **43** : 525–40.

A natural hexaploid of *Ph. pratense*, consisting of an S_2 plant of Svalöf's Omnia, was crossed as ♀ with a hexaploid form synthesized from *Ph. nodosum* with the aid of colchicine. Prior to this hybridization, the mother plant was known to have the simplex constitution for at least one locus for green *vs.* white seedlings. The synthesized *Ph. pratense* was assumed to contain very few genes for chlorophyll deficiencies and to have no such genes in common with those segregating in the mother plant. The F_1 and F_2 ratios were explicable on the basis of hexasomic segregation, as in the natural material of *Ph. pratense* investigated previously [XXIV, 369]. No difference was detected in the pairing affinity of the chromosomes originating from hexaploid *Ph. pratense* or diploid *Ph. nodosum.* The data indicated that the mother plant contained at least five loci for the normal *vs.* chlorophyll-deficient condition. Recessive genes at two of the loci conditioned albino seedlings and recessive genes at two other loci caused yellowish seedlings. The fifth recessive gene also resulted in yellowish seedlings but appeared to be intermediate in expression.

1744 DICKENSON, D. D.

The characteristics of six bromegrass (*Bromus inermis* Leyss.) clones, their polycross and single cross progeny.

Diss. Abstr. 1957 : **17** : Publ. No. 21,241 : p. 1180.

In investigations at the Minnesota Agricultural Experiment Station, panicle production was induced in six clones in the greenhouse only after the day length had been increased from 10 to 18½ hr. Cold pretreatment (0° F. for 1 week) before planting had generally no beneficial effect on panicle formation. With lengthened day, more panicles were produced on plants grown for an extra month at 65–70° F. than on those kept for three months only at 55–60°. Clones varied in response to the treatments, suggesting genotypic differences in reaction to conditions affecting induction of panicle primordia. On nonemasculated bagged panicles, seed set from selfing was less than one per panicle. Hot-water emasculation at 47° C. for 3 or 4 min. eliminated production of selfed seed except in one clone, which is presumed to have been outcrossed. First-year field data on the following 14 characters in the clones and their intercrosses and polycrosses were analysed: early spread, plant height, plant weight, date of first pollen shedding, number of panicles bearing seed, seed yield, weight of seed per 100 panicles, early vigour, late vigour, panicle type, leaf scald incidence, aftermath spread, rate of recovery and amount of aftermath. The F test indicated significant differences among genotypes for all these characters. Comparisons were made between the values for the clones and the averages of the respective single crosses, and between polycross values and the averages of single crosses in which the same ♀ parents were used. In order to explain the lack of close agreement between clonal values and single-cross averages in respect of all 14 characters, it is suggested that the clonal plants did not become as well established as the transplanted seedlings. From the combined data obtained by the author and by another investigator who continued the study of the material for another three years, it is concluded that among these clones and under the conditions of this experiment general combining ability is the rule and specific combining ability is rather infrequent.

1745 THOMSON, J. R. & KEPPIE, J. L.

Spaced-plant trials at East Craigs. IV. Strains of perennial ryegrass, *Lolium perenne* L. 1953-55.

J. Brit. Grassl. Soc. 1957 : **12** : 280–85.

Three strains from Denmark and one from Germany have been compared with three from a previous series of trials at East Craigs, Edinburgh, Scotland [cf. XXVI, 3398]. As before, a correlation was observed between earliness and growth habit but the German strain, Lembkes

Late, does not fit into either of the groups previously established.

1746 Lazenby, A.
Some effects on the yields of ryegrass strains of varying the growing technique and the conditions of management.
J. Brit. Grassl. Soc. 1957 : **12** : 257–63.

Tabulated data are included showing the yields of fine ryegrass strains under different conditions of spacing and management at the Welsh Plant Breeding Station, Aberystwyth.

1747 Antarov, B.
[The genus *Festuca* L. (fescue) in Bulgaria].
Izv. bot. Inst. (Bull. bot. Inst.)/Bull. Inst. bot., Sofia 1953 : **3** : 3–89. [Bulgarian].

A taxonomic review of *Festuca* in Bulgaria is presented and several new subspecies, varieties and forms of the following species are described: *F. cyllenica*, *F. dalmatica*, *F. duriuscula*, *F. fallax*, *F. pseudovina*, *F. pungens* and *F. xanthina*.

1748 Östergren, G.
Production of polyploids and aneuploids of *Phalaris* by means of nitrous oxide.
Hereditas, Lund 1957 : **43** : 512–16.

Two tetraploids ($2n = 24$) and two aneuploids ($2n = 23$ and 21) were obtained in the progeny of 32 plants of *Ph. canariensis* treated with nitrous oxide at a pressure of 10 atmospheres for 6–14 hr. shortly after the commencement of flowering. The progeny of 64 plants of *Ph. paradoxa* similarly treated for 4–12 hr. included two tetraploids ($2n = 28$).

The relatively high frequency of triploids obtained by Nygren [XXV, 2707] as the result of treating *Melandrium* with nitrous oxide is explained by postulating that the treatment was conducive to polyspermic fertilization.

1749 Gould, F. W.
New North American andropogons of subgenus *Amphilophis* and a key to the species occurring in the United States.
Madroño, S. Francisco 1957 : **14** : 18–29.

The species indigenous to or naturalized in the USA are reviewed and four new taxa, *A. springfieldii*, *A. reevesii*, *A. hybridus* and *A. saccharoides* var. *pulvinatus*, are described.

1750 Adati [Adachi], S., Mitsuishi, S. & Kimoto, S.
(Studies on breeding wild Japanese grasses as forage crops. IV. Analysis of the nutritive value of *Miscanthus* plants).
Mie Daigaku Nogakubu Gakujutsu Hokuku/Bull. Fac. Agric. Mie Univ. 1957 : No. **14** : 1–9. [Japanese].

Data are provided on the dry matter, moisture, protein, fat, fibre, nitrogen-free extract and ash contents of varieties of *M. japonicus*, *M. sacchariflorus*, *M. sinensis* and *M. tinctoris* [cf. XXVII, 3060].

1751 Adati [Adachi], S., Mitsuishi, S. & Ujihara, A.
(Studies on breeding wild Japanese grasses as forage crops. V. Cyto-anatomical observations on the male sterility of Imazo, a cultivated variety of *Miscanthus sinensis* var. *condensatus*).
Mie Daigaku Nogakubu Gakujutsu Hokuku/Bull. Fac. Agric. Mie Univ. 1957 : No. **14** : 11–14. [Japanese].

Pollen meiosis is normal but, after microspore formation, pollen-grain fusion occurs and the grains subsequently abort. Tapetal hypertrophy does not occur.

1752 **Perennial Sweet Sudangrass provides longer grazing.**
What's New Crops Soils 1957 : **10** : No. 1 : p. 23.

Perennial Sweet Sudan grass has been developed by the Texas Agricultural Experiment Station from (*Sorghum halepense* x *S. sudanense*) x Sweet Sudan grass. It is perennial but is not difficult to eradicate and it is expected to provide more pasture and a longer grazing season than other Sudan grass varieties. It has a higher sugar content than Sweet Sudan grass.

1753 Tateoka, T.
Notes on some grasses IV.
Shokubutsu Kenkyu Zasshi/J. Jap. Bot. 1957 : **32** : 111–14.

From an examination of the caryotype and leaf anatomy of *Brachyelytrum* spp., the author concurs with those taxonomists who have placed this genus in a special tribe, the Brachyelytreae. The tribe most closely related is believed to be the Stipeae. [Cf. 562].

1754 Weber, W. A.
A new intergeneric natural hybrid involving *Oryzopsis* and *Stipa* (Gramineae).
Rhodora 1957 : **59** : No. 707 : 273–77.

A putative hybrid between *S. neomexicana* ♀ x

O. hymenoides ♂, resembling the former species in growth habit and the latter in morphological characters, has been discovered at a single locality in Colorado.

1755 Kaushal, P. K.
Chromosomes in *Agropyron scabrifolium.*
Curr. Sci. 1957 : **26** : 321–22.

Meiosis in *A. scabrifolium* ($2n = 28$) was regular, except for delayed separation of bivalents and laggards in respectively 12% and 4% of the pollen mother cells at anaphase I. The former irregularity may have been due to late terminalization of the chiasmata. The laggards were almost invariably included in the daughter nuclei.

LEGUMINOUS FORAGE PLANTS

1756 Lubenec, P. A.
(**Breeding lucerne and sainfoin**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. **4** : 18–23. [Russian].

Mass selection of local populations on the basis of leafiness, yield of hay and seed and disease resistance has almost invariably failed to produce any improvement over the initial population and figures are presented to show that in the North Caucasus the lucerne selection known as Saratovskaja [Saratov lucerne] yielded 2–24% less than the standard variety Zajkevič in 1951–54 and that the sainfoin selection Pesčanyj Ulučšennyj [Improved Sandy] yielded 5–9% less hay and 5–27% less seed than Pesčanyj 1251 from which it was selected [cf. XXVI, 449]. Mixed sowings of cultivated lucerne with *Medicago falcata* in alternate rows gave rise to a number of hybrids, which were recognized by their flower colour and pod shape; the first generation from these plants exceeded the standard variety Slavjanskaja Mestnaja [Local Slav] by 17–38% in yield of dry matter and 26–49% in seed yield; in the F_2 the differences were respectively 14–27% and 21–35%, in the F_3, 8–15% and 14–19% and in the F_4, 4–8 and 5–11%; in the F_5 and later generations the yields were about the same as those from the standard.

In sainfoin, Hybrid 12, obtained by pollinating Pesčanyj 1251 with a number of Caucasian sainfoins, exceeded Pesčanyj 1251 by 22–38% in hay yield in the F_1 and F_2 and 9% in the F_3, the succeeding generations being equal to Pesčanyj 1251. Penza Hybrid lucerne, produced by interpollination of the best types from different regions, exceeded the standard Bol'šev'jaskaja by 9·7 c. per ha. in hay yield in the F_2, by 4·6 c. in the F_3 and by 13·2 c. in green matter in the F_1.

The fall in yield in the fourth and later generations was partially overcome when the F_4 was interpollinated with the initial parents.

1757 Krapovickas, A. & Fuchs de Krapovickas, A. M.
Notas citológicas sobre Leguminosas. II. (**Cytological notes on Leguminoseae. II**).
Rev. Invest. agríc. B. Aires 1957 : **11** : 215–18.

The following somatic chromosome numbers, counted in root-tip cells, are reported: *Indigofera suffruticosa*, 16; *Desmodium barbatum*, 22; *Aeschynomene montevidensis*, *Ae. sensitiva*, *Zornia gracilis*, *Z. latifolia*, *Z. diphylla*, *Stylosanthes montevidensis* and *S. gracilis*, 20; and *Crotalaria incana*, *Lathyrus macropus* and *L. pubescens*, 14.

1758 Rasmussen, F.
Forsøg med stammer af alsike og kællingetand 1951–1954. (**Trials of strains of alsike clover and birdsfoot trefoil, 1951-1954**).
Tidsskr. Planteavl 1957 : **61** : 495–505.

In these trials, held at various stations in Denmark, the tetraploid Øtofte $4n$ II was the best of six Alsike clover strains and Tidlig Øtofte II [Early Øtofte II] and Sildig Roskilde II [Late Roskilde II] the most productive of six birdsfoot trefoil strains.

1759 Haussmann, G.
Il valore agronomico di forme e razze di erba medica. (**The agronomic value of lucerne forms and varieties**).
Sementi elette 1957 : **3** : No. 5 : 54–56.

A general discussion is given of the desirable characteristics of lucerne strains and of methods of improving existing strains, particular mention being made of adaptation to local conditions [cf. 598].

1760 Saunoris, J.
La génétique de la luzerne (*Medicago sativa*). [**The genetics of lucerne (*M. sativa*)**].
Rev. Oka 1957 : **31** : 152–61.

In this review of published work on the above subject, the question of whether lucerne originated from an autopolyploid or an allopolyploid is discussed; the author seems to favour an autoploid origin. The improvement of polyploid plants is also considered.

1761 STORGAARD, A. K.

Genetic studies in alfalfa, *Medicago sativa*, L.

Diss. Abstr. 1957 : **17** : Publ. No. 19,324 : 203–04.

In investigations on the inheritance of flower colour at the Pennsylvania State University, nine selections, comprising four plants with white, two with yellow, two with cream and one with purple flowers, were selfed and intercrossed in all possible combinations. The four white-flowered selections produced only white-flowered progeny upon selfing. When three of the white-flowered selections [51–8(8), 51–77(3) and 51–207(10)] were intercrossed, only white-flowered progenies were obtained. Some purple-flowered plants appeared in crosses of these selections with the fourth white-flowered parent, 51–8(9). Each of the white-flowered parents therefore carried at least one complementary gene for purple colour, this gene being the same in the three first-mentioned selections. The data suggested that intensity of pigmentation is also under genetic control. Acceptable fits of theoretical ratios to the observed data were obtained only when tetrasomic or disomic-tetrasomic ratios were assumed.

1762 BORKOVSKAJA, V. A.

(Hybridization of cultivated lucernes with wild diploid species).

Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 143–53. [Russian].

Under conditions where crosses of cultivated forms of *Medicago sativa* among themselves gave sets of up to 100%, attempts to cross them with *M. quasifalcata* and *M. coerulea* gave an average of 3–4%; crosses where the wild species served as seed parent gave somewhat better results than the reciprocals. A slight improvement in set was obtained by pollinating unemasculated flowers, the proportion of hybrids in the progeny being 50–57%. Pollination of the wild species with a mixture of pollen from different cultivated varieties increased the seed set by 4–7 times; pollination of cultivated lucerne with hybrids found among wild populations also increased the set, hybrids from *M. quasifalcata* giving 8% set and up to 75% of hybrids in the progeny. Young buds and fully opened flowers gave the best sets in these experiments, as a result of which 32 hybrids have been obtained, comprising 17 from *M. quasifalcata* and 15 from *M. coerulea*. Mixed sowings of cultivated varieties with one or other of the wild species gave very low sets of seed, an average of 16 seeds per plant being produced; from 2500 seeds only 22 hybrids were produced.

Hybrids produced without emasculation, from open pollination and from pollen mixtures, showed a greater resemblance to the seed parent and revealed their hybrid origin sometimes only in their flower colour and pod shape. Plants obtained from pollinating with natural hybrids resembled the pure parent, whichever species that was, more than the hybrids.

Wide variations were observed in the degree of heterosis shown by the hybrids and in their fertility: some of them gave up to 12·6 g. of seed per plant, which is more than that from standard varieties, whereas others gave less than 3 g.

In all cases where the diploid species served as seed parent and was pollinated by the tetraploid, over 84% of the progeny were tetraploid ($2n = 32$) and most of them were relatively fertile. Two hybrids distinguished from the seed parent only in flower colour and pod form had $2n = 16$ and three sterile hybrids proved to be triploids ($2n = 24$), as were two further hybrids obtained from *M. sativa* as seed parent. All plants of the two wild species examined had $2n = 16$. Several natural hybrids between diploid and tetraploid species, e.g. *M. hemicycla* x *M. glutinosa*, also proved to be tetraploid.

The majority of the F_2 plants obtained from the above hybrids reproduced the characteristics of the F_1 plant from which they arose. The tetraploid hybrids tended to be intermediate in character while the diploid hybrids resembled the wild species. In the F_3 progeny the majority of the hybrids were scarcely distinguishable from cultivated lucerne.

From the practical point of view the most promising hybrids were those of *M. sativa* with *M. quasifalcata*, some of which have exceeded local Slavjanskaja lucerne in yield of both seed and hay, having given three cuts in a season in the Majkop area.

1763 BULLER, R. E. & VALDIVIESO G., R.

La producción de alfalfa. (**Lucerne production**).

Foll. Divulg. Secretaría Agric. Ganad., Méx. 1957 : No. 25 : Pp. 57.

Among lucernes recommended for various regions in Mexico are the following recently developed varieties. Valdura, a selection from Valenciana, yields well, has good persistence, shows some resistance to leaf spot, downy mildew, root rot and bacterial wilt and is suited to the valleys of Mexico and Toluca. Hojaseo, selected from the local lucerne Apaseo, is adapted to the same region, produces a high proportion of leaves and recovers rapidly after cutting. An erect, vigorous and persistent selection from the local variety Tanhueto, called Tanverde, recovers well after cutting and is recommended for the Bajío region.

1764 BULLER, R. E.
Semilla certificada de nuevas variedades de alfalfa. (**Certified seed of new varieties of lucerne**).
Agric. téc. Méx. 1957 : No. 4 : 14–16, 39.

The varieties Valdura, Hojaseo and Tanverde are described [cf. 1763]. Work on the production of certified seed of these and other varieties in Mexico has begun.

1765 SCHEUERPFLUG, G.
Wurzelstudien an Luzerneherkünften unter Berücksichtigung bodenphysikalischer und bodenbiologischer Faktoren. (**Root studies on lucerne of different provenance with regard to physical and biological factors of the soil**).
Bayer. landw. Jb. 1957 : **34** : 458–84.

Interspecific and intraspecific differences in root development are reported for some specimens of *Medicago sativa*, *M. media* and *M. falcata*.

1766 MARKUS, R. & WILSIE, C. P.
Inheritance of an exposed stigma mutant in alfalfa, *Medicago sativa* L.
Agron. J. 1957 : **49** : 604–06.

Normal F_1 progeny were obtained from a cross between a normal plant and a mutant with exposed stigmas. Of 17 F_2 progenies, nine gave ratios of normals to abnormals approximating to 35 : 1 and eight gave ratios of 3 : 1; the back-cross ratios were 5 : 1 and 1 : 1 respectively. Tetrasomic inheritance of a single factor was assumed; the genotypes of the abnormal and normal plants were thought to be *aaaa* and *AAAa* respectively. Deviations from the expected ratios may be explained by postulating partial selection against recessive gametes. The possibility of double-reduction gametes being formed was discussed.

1767 WHITEHEAD, M. D. & PINNELL, E. L.
Severe damage from bacterial stem blight of alfalfa in Missouri.
Plant Dis. Reptr. 1957 : **41** : 876–77.

Missouri, Ladak and Vernal showed the highest resistance to *Pseudomonas medicaginis* in the lucerne nurseries at Columbia; some introductions of the low crown type showed good resistance.

1768 COPE, W. A.
Inheritance of rust resistance in alfalfa.
Diss. Abstr. 1957 : **17** : Publ. No. 20,178 : 481–82.

Each of the three populations studied "consisted of cloned and selfed progenies of the parents, F_1, F_2, and backcrossed progenies". According to the models obtained by the partitioning technique of Powers, reaction to rust (*Uromyces striatus*) depended on major genes at three or four loci, and possibly one or more additional genes with smaller effects. The models and progeny means indicated that genes for resistance were partially dominant at two loci while susceptibility was dominant in the case of one locus and possibly two other loci. Interallelic interactions also occurred. Variance due to dominance was equal to or slightly less than additive variance. The genetic variances estimated from the analysis of variance were in close agreement with the theoretical variances computed from the models obtained by partitioning. Estimates of heritability in most cases ranged from 20 to 50%.

1769 **Moapa alfalfa highly resistant to spotted aphid.**
What's New Crops Soils 1957 : **10** : No. **3** : p. 22.

This variety was selected at the University of Nevada Agricultural Experiment Station from African and apart from its resistance to *Therioaphis maculata* is similar to the parent variety.

1770 LAUMONT, P. & LABY, H.
Que vaut la luzerne arborescente? (**What is the value of shrubby lucerne ?**)
Élevage et Cultures, Alger 1956 : No. **87** : unpaginated.

In this review data are provided on the yield from five clones of *Medicago arborea* grown at Maison Carrée.

1771 DEXTER, S. T.
Adaptability and yield trials of several new alfalfa varieties.
Quart. Bull. Mich. agric. Exp. Sta. 1957 : **40** : 12–18.

In the above trials held in Michigan, Narragansett gave higher yields than Ranger and appeared to be less susceptible to leaf diseases; it equals Grimm and Hardigan in winter hardiness.

1772 Łączyńska-Hulewiczowa, T.
Badania nad sztucznymi poliploidami. Część I. Koniczyna czerwona. (**Investigations on artificial polyploids. Part I. Red clover**).
Roczn. Nauk Rolnicz. : Ser. A : 1957 : **75** : 291–338.

Łączyńska-Hulewiczowa, T.
Investigations on tetraploid red clover.
Bull. Acad. polon. Sci. 1957 : **5** : 307–12.

Compared with diploid clover, selected colchicine-induced tetraploid material studied at the Institute of Plant Breeding of the Polish Academy of Sciences had larger stomata and epidermal cells and a higher phloem/xylem ratio in the stems, gave better yields, especially on dry and light soils, was leafier and richer in protein and showed higher self fertility. The 1000-seed weight was higher but seed production was low, partly because of late flowering and ripening and partly because of the long floret tubes rendering pollination by bees impossible. Pollen was normal. No crossing with diploids occurred.

Hexaploids and octoploids were small and weak with a low number of cells per leaf.

1773 Mittelholzer, A. S. & Steppler, H. A.
Note on a simple and efficient method for selecting tetraploids from a population of red clover plants of unknown ploidy.
Canad. J. Pl. Sci. 1957 : **37** : 440–41.

At the Macdonald College, Que., a population of 185 C_2 plants was tested for tetraploidy by pollination with one or more of four tester tetraploids, A, B, C and D, which were cross compatible with one another. All plants were pollinated by A. If seed was produced, the amount was recorded and no further crossing carried out. Plants yielding no seed were pollinated by B. Individuals still failing to produce seed were then pollinated by C, and, if necessary, D. Plants bearing seed in any test cross were classified as tetraploid. Plump seed (3–75%) was obtained from 184 plants, of which 156 were found to be tetraploid in a cytological examination. The single plant failing to give seed proved to be a diploid. Chromosome counts were not carried out on the remainder of the population as the metaphase plates were unsatisfactory. The authors suggest that, as a method of distinguishing tetraploids, crossing with tester 4*n* males has the advantage of not requiring elaborate equipment, highly trained technicans or time-consuming cytological examination. It also provides useful preliminary data on seed-setting ability.

1774 Pavlenkov, V. S.
(Intervarietal crossing of red clover).
Agrobiologija (Agrobiology) 1957 : No. 2 : 35–38. [Russian].

The yields of local populations and of the standard Moscow 1 were improved by open pollination at the Ivanovo Agricultural Institute. Two local populations grown separately outyielded the standard, but the latter was more productive than a mechanical mixture of the two.

1775 Dijkstra, J.
Symptoms of susceptibility and resistance in seedlings of red clover attacked by the stem eelworm *Ditylenchus dipsaci* (Kühn) Filipjev.
Nematologica, Leiden 1957 : **2** : 228–36.

Data are provided on the symptoms found in a number of varieties after inoculation with *Ditylenchus dipsaci.*

1776 Sikka, S. M., Swaminathan, M. S. & Mehta, R. K.
Induced polyploidy in Egyptian and Indian clovers.
Nature, Lond. 1958 : **181** : 32–33.

In investigations at the Indian Agricultural Research Institute, New Delhi, the colchicine treatments giving the highest percentages of tetraploids of Egyptian clover (*Trifolium alexandrinum*) and Indian clover (*Melilotus indicus*) were respectively immersion of the shoots of one-week-old seedlings in 0·1% for 8 hr. and immersion of whole seedlings at this age in 0·05% for 4–8 hr.

Tetraploids of Egyptian clover were consistently superior to the diploids in growth and yield of green fodder. The average percentage of dry matter in the fodder was 25·71 in the diploids and 17·57 in the tetraploids. Wide variation was however found among the tetraploids in dry-matter percentage, several plants having a content as high as 25–27%. Nodule and root development were better in the tetraploids. Diploids and tetraploids did not differ in the N and P contents of the fodder. The Ca content was however 3·06% in the tetraploids, as against 1·54% in the diploids. The maximum number of quadrivalents per cell at diakinesis and metaphase I in the tetraploids was six, the mean frequency being 2·8. At metaphase II, 39% of the PMCs had unbalanced numbers of chromosomes. Seed setting, as measured by number of seeds per inflorescence, was 17·8–55·7% of that in the diploids. The tetraploids had however nearly twice as many inflorescences per plant; some tetraploids therefore surpassed the diploids in number of seeds produced. No aneuploids were found among the tetraploids. In controlled pollinations, tetraploids and diploids were cross-compatible. It is concluded that it may be possible to develop 4*n* strains of Egyptian clover superior in yield to existing diploid varieties.

Tetraploids of Indian clover did not show any economic promise, their fodder yield being low because of poor spreading capacity and vigour. They were also more susceptible to attack by aphids and downy mildew. Seed setting ranged from 25·2 to 45·5% of that in diploids. The mean frequency of quadrivalents per cell at diakinesis was three. Diploid and tetraploid plants were cross compatible.

Diploids of Indian clover have nearly the same cell size as 4*n* Egyptian clover; no variability in cell size was found within the former species. Support was therefore gained for the view of Schwanitz that once an optimum cell volume has been reached in a species further increase will lead to a depression in growth.

1777 VACEK, V. & DĚD, J.
(*Trifolium ambiguum* M. Bieb).
Za socialist. sel'skohozjajstv. Nauk. (For socialist agric. Sci.), Praha : Ser. A. : 1957 : **6** : 343–54. [Russian].

Introduction trials of *T. ambiguum* originating from the Black Sea area were carried out at Brno and Uhřetice. The species, which has a wide ecological adaptation, proved productive of high-quality forage and well adapted to the Czechoslovakian climate.

1778 ANDRUKOVIČ, V. I.
(*Vicia dasycarpa*, a valuable fodder plant).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 68–69. [Russian].

On account of its drought resistance and high protein content, in both of which it has exceeded *V. sativa* in the arid areas of the Georgian SSR, a form of *V. dasycarpa* has been released under the name Gruzinskaja [Georgian].

1779 KISHIKAWA, H.
(The progeny of artificial tetraploids of the Japanese velvet bean).
Senshokutai (Chromosome)/Kromosomo 1956 : Nos. 30–31 : 1070–76. [Japanese].

A morphological and cytological description is given of colchicine-induced tetraploid plants. The 4*x* plants were later than the 2*x* progenitors and the fertility was poor. A diploid plant arose parthenogenetically from one of the F_3 tetraploids.

1780 SMITH, T. E. & FLETCHER, J. W.
Progress in the development of root knot resistant varieties of sericea *Lespedeza* (*L. cuneata*).
J. Elisha Mitchell sci. Soc. 1957 : **73** : p. 238. (Abst.).

The varieties Arlington and Common were subjected to individual-plant selection, using seed from cleistogamous flowers. Seven strains possessing a high degree of resistance to common root knot (*Meloidogyne* sp.) have been developed from three of the original selections; evaluation of their forage yield and quality is in progress.

1781 **Study basic problems in sweetclover breeding.**
Iowa Fm. Sci. 1957 : **12** : No. 2 : p. 16.

A breeding technique which allows of two generations a year is briefly outlined. The second generation is grown during the winter in greenhouses.

1782 ATABEKOVA, A. I.
(New forms of sweet lupin).
Izv. Timirjazev sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : No. 2 : 62–72. [Russian].

The hybrid progenies of *Lupinus linifolius* ♀ with *L. angustifolius* vars. *coeruleus, roseus* and *albus* ♂ are described. The F_1 plants were always bitter, but among the segregates in the F_2, F_3 and F_4 were sweet lupins and some chimeras in respect of seed colour. Some forms have small seed.

1783 RZEGOCIŃSKA, L.
Attempts at generative hybridisation of different species of lupine by vegetative grafting.
Bull. Acad. polon. Sci. 1957 : **5** : 183–86.

Reciprocal grafting was carried out at the Institute of Plant Breeding, Poznań, Poland, between *Lupinus albus*, *L. luteus* and *L. angustifolius* but successful unions were only obtained when *L. angustifolius* was grafted on to *L. albus*. Plants obtained after four generations of grafting were morphologically identical with *L. angustifolius*.

1784 TURNER, B. L.
The chromosomal and distributional relationships of *Lupinus texensis* and *L. subcarnosus* (Leguminosae).
Madroño, S. Francisco 1957 : **14** : 13–16.

The only chromosome number found in natural populations of the above two species, both endemic to Texas, was $n = 18$. Although similar to one another and overlapping in range, the two species appear not to hybridize.

1785 Erbe, L.
Studies on the crossability of *Lupinus texensis* and *Lupinus subcarnosus.*
Madroño, S. Francisco 1957 : **14** : 17–18.

An attempt to cross the above species artificially was unsuccessful.

1786 Phillips, L. L.
Chromosome numbers in *Lupinus.*
Madroño, S. Francisco 1957 : **14** : 30–36.

The chromosome numbers of 26 North American taxa were determined. All species had $n = 24$ chromosomes except *L. caudatus* (24 and 48), *L. laxiflorus* (24 and 48), *L. leucaphyllus* (24 and 48), *L. perennis* (24 and 48), *L. saxosus* (48), *L. suksdorfii* (48) and *L. sulphureus* (24 and 48). An interspecific hybridization study of eight species showed successful crossing between all species except *L. lepidus.*

1787 Schwarze, P. & Hackbarth, J.
Untersuchungen über die Alkaloidkomplexe von gelben, blauen und weissen Lupinen. (**Investigations on the alkaloid complexes of yellow, blue and white lupins**).
Züchter 1957 : **27** : 332–41.

The alkaloids present in a series of varieties and races of *Lupinus luteus*, *L. angustifolius* and *L. albus* were identified by paper chromatography. Marked differences were found between species and between races within a species in respect of the alkaloid content; for example lupinin was found to be the principal alkaloid in yellow lupins and lupanin in blue and white lupins. Only slight traces of spartein were found in the wild forms of *L. luteus* and in race 80, whereas in most yellow lupins this is one of the principal alkaloids; the bitter forms of white lupin had more oxylupanin than the sweet forms. The genetic basis for these differences is discussed; the genes *dulcis*, *amoenus* and *liber* vary in their effect on the alkaloids found in yellow lupins.

1788 Savvičev, K. I.
(**The fodder lupin Bystrorastuščij 4**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 44–45. [Russian].

The sweet lupin Bystrorastuščij 4 was selected from a hybrid population of *Lupinus luteus*; its mean yield of green matter over a seven-year period was 54 c. per ha. more than that from Weiko and its seed yield was 1 c. more. Its seeds contain 0·025–0·056% of alkaloid, compared with 0·028–0·068 for Weiko; their protein content is 41·5% compared with 41·2% in Weiko. The variety ripens its seed 2–3 days earlier than Weiko and can be cut for fodder 10–15 days earlier.

1789 Ledingham, G. F.
Chromosome numbers of some Saskatchewan Leguminosae with particular reference to *Astragalus* and *Oxytropis.*
Canad. J. Bot. 1957 : **35** : 657–66.

Chromosome counts were made for 39 species; 29 of these counts are published for the first time. Saskatchewan species of *Astragalus* fell into two groups; one has $2n = 22$ or 24 and the other has $2n = 16$ or 32; most American species belong to the first group. It is suggested that these two groups should be considered as separate genera.

1790 Łączyńska-Hulewiczowa, T.
Investigations on tetraploid serradella (*Ornithopus sativus*).
Bull. Acad. polon. Sci. 1957 : **5** : 313–16.

At the Poznań Centre of Plant Breeding, colchicine-induced tetraploids of Bydgoska were distinguished from the diploid by greater cell size, higher yields of both green and dry matter and better resistance to drought and *Colletotrichum trifolii.* Seed yield was lower but varied in different lines and may respond to selection.

1791 Dufournet, R.
Note sur le voanjobory (*Voandzeia subterranea* Dup. Thouars) cultivé à Madagascar. (**Note on *V. subterranea* Dup. Thouars cultivated in Madagascar**).
Riz et Rizic. 1957 : **3** : 169–72.

Information is provided on the productivity and chemical composition of the seed of seven cultivated forms of *V. subterranea.*

ROOTS AND TUBERS

1792 Varga, A.
Mesterséges poliploid növények előállítása különös tekintettel a colchicinmódszerre. (**The production of artificial polyploids with special reference to the colchicine method**).
KisérlÜgy. Közl. 1956 : **50** : 81–87.

Various methods of inducing polyploidy are briefly discussed. At the Sopronhorpács Institute of Plant Breeding and Research, 50–70% tetraploidy was induced in beet by the application of 0·05–0·1% aqueous solutions of colchicine to the apex of seedlings in the cotyledon phase.

1793 Helm, J.
Über die historische Entwicklung der Gliederung von *Beta vulgaris* L. in Untersippen und deren Nomenklatur. **(The historical development of the subdivision of *B. vulgaris* L. into subraces and the nomenclature of them).**
Kulturpflanze, Berlin 1957 : **5** : 55–74.

A table is presented in which the terms used for denoting the various forms of cultivated beets by different authors from 1539 to 1720 and in the successive works of Linnaeus are set out. The possible identity of the types designated is discussed and the conclusion is reached that the botanical varieties established by Linnaeus, mostly on the basis of those of Bauhin, comprised only the leaf beets and the red beetroots. Confusion has arisen from the use by later authors of var. *rubra* sometimes to denote the red leaf beet and sometimes the red beetroot and it has been thought desirable to establish a new system for the species as we now know it [cf. XXVII, 625].

1794 Marx, R.
Über die Anfälligkeit der *Beta*-Arten für das Rübenmosaikvirus nach mechanischer Inokulation. **(On the susceptibility of *Beta* species to the beet mosaic virus after mechanical inoculation).**
Phytopath. Z. 1957 : **31** : 79–84.

B. lomatogona and *B. trigyna* of the section *Corollinae* were tested in the field and appeared to be completely resistant to the virus. In greenhouse tests three species of the section *Patellares* showed partial resistance and three species and a hybrid from the *Vulgares* group were found to be susceptible.

1795 Jähnl, G.
Ergebnisse der Rübenversuche des Jahres 1956. **(Results of the root trials of the year 1956).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1957 : No. 39 : Pp. 93. (Mimeographed).

Varietal differences in yield of tubers, dry matter, protein and sugar content are reported for a number of mangels, sugar beets, swedes and turnips. Amongst the mangels, Kirches Koloss [Kirches Colossus] and Zentaur [Centaur] have given high yields. A number of Polish sugar beets have done well; Dobrovice N gave the highest yield of sugar at Gumpenstein. Weisse Schmalz [White Schmalz] was the best of the swedes tested and Steirische Walze was the highest yielding turnip.

1796 Knapp, E. & Mündler, M.
Über die Nachkommenschaften (F_1 und F_2) einer Kreuzung Futterrübe x Mangold. **(On the progenies (F_1 and F_2) of a mangel x chard cross).**
Landw.-ang. Wissensch. undated : No. 57 : 61–77.

The F_1 progeny of Eckendorfer Gelbe [Eckendorfer Yellow] mangel x Mangold Silber [Silver chard] were intermediate between the parents with respect to morphological characters and dry weight; the average refractometer value was higher than that of either parent. Data are provided on the correlations between these characters in the F_2.

The value of breeding mangel x chard crosses and the possible origin of sugar beet from such a cross are briefly discussed.

1797 Horváth, A.
A takarmányrépa fajtakérdése. **(The varietal question in mangels).**
Magyar Mezőgazdaság 1957 : **3** : 15–16. [From: Hungar. agric. Rev. 1957 : **6** : No. **3** : p. 2. (Abst.)].

Mention is made of the tetraploid Beta rózsa [Rose Beta], which in Hungarian tests has given higher yields of roots and dry matter than diploid Beta rózsa and is better in storage quality.

1798 Meier, W.
Die Lagerfähigkeit verschiedener Futterrübensorten. **(The keeping quality of different mangel varieties).**
Mitt. schweiz. Landw. 1957 : **5** : 207–09.

After four months storage, tonnage varieties such as Corona Original were found to have lost relatively more dry matter and sugar and suffered greater decay than the variety Øtofte Yellow, which is rich in sugar and dry matter.

1799 Shibutani, S. & Okamura, T.
(Studies on F_1 turnip hybrids).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 15–20. [Japanese].

The mode of inheritance of numerous plant characteristics was studied in the F_0–F_1 generations of 14 crosses involving 13 Japanese varieties. The following characteristics were generally dominant: pubescent *v.* glabrous leaves, spreading *v.* erect habit, green *v.* white pigmentation of the portion of the root above ground, purplish red (cyanin) *v.* clear red (pelargonin) pigmentation of the petiole and underground portion of the root, and epidermal cells of the testa swelling in water *v.* failure to swell in water [cf. XXIV, 3101]. Inheritance was intermediate in the case of the characters:

leaf shape, root shape, root texture, rate of development of the root and bolting period. In the cross between a variety with white roots and another with clear-red roots, the F_1 plants had purplish-red roots.

1800 Opsahl, B.
Forsøk med sorter og stammer av nepe 1953–56. (**Trials of varieties and strains of turnip, 1953-56**).
Forskn. Fors. Landbr. 1957 : **8** : 433–46.

In trials of 17 varieties and strains in 12 localities in Norway, a significant interaction was observed between strain and locality. Majturnips, Roskilde B [May turnip strain Roskilde B] and Kvit Mai, Forus [White May strain Forus] were the most resistant to club root and significant intervarietal differences in resistance to *Cortophila* were found.

1801 Homola, J.
Brukev k rychlení. Vyšlechtění nové odrůdy a zlepšení agrotechniky. (**A forcing kohl-rabi. The breeding of a new variety and an improvement of agricultural methods**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinña Výroba 1957 : **30** : 585–604.

Pražská Bílá Raná k Rychlené [Prague White Early Forcing] was selected from Pražská Bílá Raná. It combines the high quality of the parental form with improved resistance to bolting, greater earliness and a high percentage of top-grade marketable bulbs.

Mention is made of a hybrid of Pražská Bílá x Roggli Polní [Roggli Field], which has reached an advanced stage in selection. This produces kohl-rabi bulbs of the same quality as those of Pražská Bílá and exceeds Roggli Polní in earliness and vigour. It is moderate in its external requirements.

1802 Romanova, M.
(**The kohl-rabi variety Venskaja Belaja 1350**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : p. 56. [Russian].

Venskaja Belaja 1350 [Vienna White 1350] was bred at Gribovo. It yields 100–150 c. per ha. and has a short growth period of 60–70 days.

1803 Planteforedlerne har ikke tatt hensyn til at potetene skal tas opp med maskin. (**Plant breeders have not taken into account that potatoes are mechanically harvested**).
Norsk. Landbr. 1957 : No. 20 : 423–24, 427.

In this short report of some of the papers read at the 4th European Potato Congress, held at Lund in August, 1957, it is noted that W. Rudorf spoke on breeding for disease resistance in Germany and A. P. Lunden and B. Jacobsen on resistance breeding in Norway and Denmark. Varietal differences in resistance to damage during mechanical harvesting were discussed by D. Simons.

1804 Puşkarev [Puškarev], I.
Îmbunătătirea lucrărilor de ameliorare şi di înmulţire a cartofilor de sămînţă. (**The improvement of the breeding and seed production of the potato**).
An. Romîno-Soviet. : Ser. Agric. 1956 : No. 5 : 61–68.

This paper is a Rumanian translation of a Russian original [XXVI, 3454].

1805 (**How to improve the quality of the potato**).
Nauk. pered. Opyt Sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 9 : 50–51. [Russian].

An account of breeding work at the Potato Institute in question and answer form is given. It includes a list of hybrids with high yield, earliness, resistance to *Synchytrium* and *Phytophthora* and a high starch or protein content. Seedling 3794 is very early, Seedling 4646 combines resistance to *Synchytrium* and *Phytophthora*, Seedling 2675 has a starch content of 20% and Seedling 8131 a protein content of 3%. *Solanum semidemissum*, *S. andigenum* and *S. phureja*, which had the highest protein content among the 46 wild species studied, are being used for breeding new varieties with a high protein content.

1806 Schechaj, R.
Perspectiva del trabajo fitotécnico y de la producción de semilla de papa en la zona noroeste de la República Argentina. (**Prospects of breeding work and of seed production of potato in the north-western zone of Argentina**).
Rev. agron. Noroest. argent. 1957 : **2** : 369–400.

A system is described whereby two crops of tubers a year can be obtained, by planting in December at 1850 m. and in July at 366 m. altitude. However, varieties reacted differently and the need to breed varieties specially designed for the area is urged.

1807 ZACHARIAS, M.
Über die Anwendbarkeit der Methode der vegetativen Annäherung zur Erhöhung der Kreuzbarkeit einiger Wildkartoffelarten mit der Kulturkartoffel. (**The applicability of the method of vegetative rapprochement for increasing the compatibility of some wild potato species with the domestic potato**).
Kulturpflanze, Berlin 1957 : **5** : 240–52.

No influence of *Solanum acaule* on the growth habit of the potato varieties Aquila and Flava after being grafted upon them could be detected; in reciprocal grafts, the tuber production of the wild species *S. acaule*, *S. chacoense* and *S. schickii* was increased. Pollinations were effected between the wild and cultivated partners of these grafts; no fruits were obtained in crosses with *S. acaule* either from the grafted plants or from control crosses with ungrafted material. In the cross with *S. chacoense* one fruit was obtained from the grafted and two from the ungrafted material and in crosses with *S. schickii* one fruit from each. There is thus no indication that the incompatibility of these combinations is reduced by grafting.

1808 AL'SMIK, P. I.
(**Breeding potatoes by taking into account the constitution of the plant**).
Kartofel' (Potato), Moskva 1957 : No. **4** : 47–51. [Russian].

The constitution of the plant is taken as comprising such properties as habit, phasic development, reaction to diseases, response to agronomic conditions, disposition to degeneration and a number of other features, the aggregate of which determines the behaviour in the field. Some varieties comprise forms differing in constitution, such as those branched at the base, which are generally free from degeneration, and unbranched forms, which are generally more prone to degeneration, though their yields in the early tuber generations are often greater; in making crosses the breeder is recommended to combine parents belonging to these opposing types, since the branched types are considered to be phasically juvenile and of high vitality and the unbranched tend to be earlier in maturity. The importance of the maternal parent is illustrated by the blight-resistant variety 728–44 which gives rise to up to 68% of resistant seedlings when used as seed parent and only 13% when used as pollinator. In general it is recommended that the parent with the more vital constitution should be used as seed parent.

1809 KRAEVOJ, S. JA.
(**Potato and tomato grafting**).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1957 : No. **3** : 65–75. [Russian].

Experiments on graft hybridization carried out at the Institute of Genetics of the USSR Academy of Sciences in 1938–1940 are cited as evidence that no changes occur in graft hybrids or that the changes obtained are of a temporary kind and not heritable. The material comprised intervarietal grafts between domestic potato varieties, interspecific grafts between domestic varieties and wild species such as *Solanum demissum* and *S. antipovczii*, and tomato/domestic potato grafts.

1810 **Issue on varieties.**
Potato News Netherlands 1957 : **7** : No. **1** : Pp. 24.

The chief varieties grown in Holland are briefly described; varietal properties and yields are compared.

1811 KELLER, E. R.
Fina, eine neue Kartoffelsorte im schweizerischen Richtsortiment. (**Fina, a new potato variety in the Swiss official list**).
Mitt. schweiz. Landw. 1957 : **5** : 211–12.

Fina is a high-yielding variety suitable for cooking; it does not quite equal Bintje in starch content. It surpasses Bintje in resistance to late blight and is fairly resistant to scab and viruses but not to hollow heart.

1812 **New potato variety, Tawa, is introduced.**
Iowa Fm. Sci. 1957 : **12** : No. **3** : p. 6.

Further information is given on the above variety, already referred to [cf. 684]. It is a selection from a cross between two USDA seedlings.

1813 WANGENHEIM, K.-H. VON
Polyploidie und Kreuzbarkeit—ein botanisches Rätsel. (**Polyploidy and cross compatibility—a botanical riddle**).
Umschau 1957 : **57** : 679–82.

A popular account of work described in detail earlier [XXVII, 4142] is presented.

1814 HOUGAS, R. W. & PELOQUIN, S. J.
A haploid plant of the potato variety Katahdin.
Nature, Lond. 1957 : **180** : 1209–10.

A plant with $2n = 24$, presumed to be a haploid of Katahdin which arose parthenogenetically in the cross Katahdin x *Solanum rybinii*, occurred in the course of investigations carried out by the USDA Agricultural Research Service in cooperation with the Wisconsin Agricultural Experiment Station. The haploid is vigorous, although its rate of growth is considerably slower than that of triploid F_1 hybrids from the above cross. The marked difference in height between the F_1 hybrids and haploid is largely due to the short internodes of the latter. The stomata and mature leaves of the haploid are smaller than in the F_1 triploids and Katahdin. The haploid has not yet flowered.

1815 Pohjakallio, O., Salonen, A. & Antila, S.
Analysis of earliness in the potato.
Acta agric. Scand. 1957 : **7** : 361–88.

In studies of nine commercial varieties, eleven F_1 clones of *Solanum demissum* x Rosafolia and two F_1 clones of Tammisto Early x *S. demissum*, grown in Finland, earliness of onset of flowering showed little dependence upon photoperiod but displayed considerable intervarietal and interclonal differences. Differences in vegetative development amongst clones and varieties were largely determined by varietal and clonal reaction to photoperiod but were partly independent of environmental conditions. The haulms of early potatoes were infected by blight earlier and therefore more severely than late varieties.

1816 Szalai, I.
Zusammenhänge zwischen der Keimung der jungen (in Keimruhe befindlichen) Knollen bei verschiedenen Kartoffelsorten und der Konzentration des Stimulationsgemisches. [**Relations between the sprouting of young (dormant) tubers of different varieties and the concentration of the stimulant mixture**].
Acta agron., Budapest 1957 : **7** : 25–36.

Potato varieties studied at the Institute of Plant Physiology of Szeged University, Hungary, fell into two groups when treated with rindite. The one group, which included Korai sárga [Early Yellow] and Margit, sprouted equally well under all concentrations and durations of treatment, while in the other group, which included Ella, Gül-Baba and Kisvárdai Rózsa [Kisvárda Pink], different varieties had different optimum treatments.

1817 Szymusik-Kumelowska, I.
Wartość skrobiowa ziemniaka a wydajność alkoholu. (**Starch value of potatoes and alcohol productivity**).
Hodowla Roślin Aklimatyz. Nasiennictwo 1957 : **1** : 135–48.

In tests of different potato varieties, the quantity of alcohol produced per 100 kg. potatoes increased with increasing starch content but the yield of alcohol per 100 kg. starch decreased. No relation was observed between alcohol yield and size of starch grains but there was a positive correlation between saccharification limit and alcohol yield per 100 kg. starch.

1818 Ivančenko, G. Z.
(**The starch content of potato hybrids**).
Agrobiologija (Agrobiology) 1957 : No. 3 : 105–08. [Russian].

Tuber analyses of some potato seedlings carried out at Moscow showed that their starch contents did not give a true indication of the starch content of their subsequent tuber progenies, many of which had an appreciably higher or lower starch content than the original seedlings. The differences in the starch contents between the first and second tuber generations were less noticeable and did not exceed 3%. Starch content of seedlings varied considerably according to season; in established varieties such variability was low.

1819 Unrau, A. M. & Nylund, R. E.
The relation of physical properties and chemical composition to mealiness in the potato. I. Physical properties.
Amer. Potato J. 1957 : **34** : 245–53.

According to the results of the evaluation of mashed samples of Red Pontiac, Cobbler and Waseca by a taste panel, potatoes within a variety which differ in specific gravity, differ in mealiness, and potatoes identical in specific gravity but representing distinct varieties may also show disparities in mealiness, depending on the varieties under comparison. The physical characters which were found to be associated with mealiness are indicated. Size of the starch granules in raw tubers was not related to mealiness.

1820 Höppner, E. & Geidel, H.
Stärkeleistungen der im Grünen Plan geförderten 12 Sorten. (**Starch productions of 12 varieties promoted in the Green Plan**).
Kartoffelbau 1957 : **8** : No. 12 : Stärke Kartoffel : **2** : No. 6 : 2–4.

Of the 12 varieties studied in Western Germany during 1953–7, Fabricia had the highest starch content and Capella gave the highest yield of starch. Descriptions of each variety tested are provided.

1821 Zubeldia, A.
Sobre un muestrario de variedades.
(On a varietal collection).
ASPAS, Madr. 1957 : No. 24 : 2–4.

An account is given of the potato collection maintained by the Vitoria Potato Breeding Institute, Spain, comprising 176 introduced and recent Spanish varieties and clones and 23 old Spanish varieties. The varietal data recorded are noted and some difficulties involved in maintaining certain varieties are mentioned. Smaller collections of mutants, disease-resistant material, varieties from the Canary Islands and species allied to *Solanum tuberosum* are also maintained.

1822 Trip, J.
On the inheritance of spraign resistance in potato varieties.
Euphytica, Wageningen 1957 : **6** : 185–88.

Information is given on the influence of different parental varieties upon the sprain resistance of their seedlings, as indicated by field trials carried out in Friesland, Netherlands. In order to determine the effect of one variety (A) upon another (B), the hybrid seedlings were compared with B itself; it was assumed that no differences occurred between A x B and B x A combinations. Parents having a favourable effect upon resistance in the limited number of combinations tested comprised Bintje, Engelum Y226, Record, Craigs Defiance, Bravo, Jubileum, Triumph and Rode Star.

1823 Pieringer, A. P.
A greenhouse method for determining the disease reaction of potato seedlings to common scab caused by *Streptomyces scabies* (Thaxt.) Waks. & Henrici.
Diss. Abstr. 1957 : **17** : Publ. No. 20,024 : p. 5.

Methods of evaluating seedlings for scab reaction were studied with a view to facilitating breeding for resistance. Tuber infection occurred under greenhouse conditions if seedlings from true seed or seed tubers were grown to maturity in infested soil, a mixture of equal parts of vermiculite and ordinary potting soil being found superior to soil only as a medium for obtaining infection and the subsequent development of lesions characteristic of susceptibility. On the basis of tuber infection and number of such lesions, infestation of the mixture prior to the time the seedlings were transplanted proved to be the best method of inoculation. The results of infection by the greenhouse method tallied with those obtained by field infection. The type of tuber periderm was a reliable indication of resistance, tubers in which the periderm consisted of well-defined layers of living cells being resistant. Variable results were obtained from tests to determine the relationship between resistance and the amount of chlorogenic acid in the tuber cortex.

1824 Bečjus, K.
(Varieties bred in Latvia).
Kartofel' (Potato), Moskva 1957 : No. 4 : 52–53. [Russian].

Seven varieties are described. Krahmalistyj [Starchy], is a selection from Stärkeragis; Tiesa, from Jubel x the Scottish seedling 967(c)38, is relatively blight resistant; Puntukas, from Pepo x (*Solanum andigenum* var. *tocanum* x Centifolia), has tubers weighing up to 164 g.; Vilija, from Wohltmann x Pepo, resembles Wohltmann but is wart resistant; Ruta, from a seedling of unknown origin x Milda, is a late variety resistant to blight; Pirmunes, from Pepo x Pisarev's seedling (*S. andigenum* var. *tocanum* x Centifolia), is a very early variety that can be lifted at the beginning of July; and Šatrija, from Aquila x Mittelfrühe [Midearly], is resistant to blight.

1825 Takase, N.
(Studies on the resistance of potatoes to late blight. V. On the genes responsible for resistance of potatoes to late blight and differences in their mode of action).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 17–23. [Japanese].

Resistant potatoes bred in Japan from *Solanum tuberosum* x *S. demissum* crosses have been shown to possess the two resistant genes R_1 and R_4. The inoculation tests were made with blight strains 0, 1 and 4, corresponding to designations H_1, H_3 and H_2, respectively, of earlier Japanese papers. R_4 is less effective than R_1 and permits a dense aerial mycelium.

1826 Howatt, J. L.
The late blight disease of potatoes and its causal fungus in Canada.
Amer. Potato J. 1957 : **34** : 185–92.

Surveys conducted in the period 1954–56 resulted in the isolation of fourteen races of *Phytophthora infestans* in nine provinces. Race 4 appeared to be most common and race 1, 4 was widely distributed. It was found that the potato genotypes internationally used for the identification of races of *Ph. infestans* cannot always be relied upon to register in one determination the correct race; most blight races are not consistent in registering on the susceptible genotypes. Race 1, 3, 4 may register only on

R_3 and R_4 or register on R_4 and $R_{3,4}$ and not on R_3.

1827 KAMERAZ, A. JA.

(What is new in breeding potatoes resistant to blight).

Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. **3** : 19–24. [Russian].

New races of *Phytophthora infestans* have appeared in Leningrad since 1949; though the F_1 of *Solanum demissum* x *S. tuberosum* hybrids may be resistant to these races, only 4% of resistant seedlings appear in the first back cross with *S. tuberosum* and none in the second.

Seedlings that were resistant in the leaf might or might not have resistant tubers but plants that were resistant in the tuber were almost invariably resistant in the leaf too. Seedlings that appeared resistant in early growth phases might be attacked in later phases.

In leaf-infection tests carried out in 1956 with 986 seedlings, all seedlings of Robinia, a susceptible variety, and hybrid 1, which is resistant to the common strain, were attacked by the new strain after 3 days, when 43% of the seedlings remained free from infection; after 4 days 35% remained free and after 6 days only 4%; only 0·9% of the seedlings remained free in tuber tests. The families with the greatest resistance were (*S. demissum* var. *kitlense** x Cobbler) x Oktjabrenok [Little Octobrist] x Oktjabrenok; (*S. demissum* var. *kitlense* x Priekul'skij Rannij [Priekuli Early] x Oktjabrenok x Olev; (Arran Cygnet x *S. demissum* 022) x Frühmölle x Frühmölle; (Courier x *S. demissum*) x Katahdin x Frühmölle; Coerulea x (Doon Pearl x *S. demissum*) x Gloriosa x Katahdin x Stärkeragis; and (*S. antipoviczii* x Cobbler) x *S. tuberosum* x Priekul'skij Rannij.

1828 TAKASE, N.

An additional report on the difference in phenotypic expressions between genes, R_1 and R_4, controlling resistance to *Phytophthora infestans* in potatoes.

Euphytica, Wageningen 1957 : **6** : 189–92.

In investigations at the Hokkaido National Agricultural Experiment Station, Japan, tubers of Black's series of differential hosts and of the author's series were inoculated with races H_1 (= 0), H_2 (= 4), H_3 (= 1), $H_{2,3}$ (=1, 4) and BH_4 (= 2) of *Ph. infestans*. In the latter series, *Rb* resulted in a weaker type of resistance to race 1 than *Ra*. The reaction due to *Rb* consisted of fibrous necrosis (type f), followed by the emergence of copious aerial hyphae. It is concluded that *Ra* is identical with R_1 and *Rb* with R_4.

1829 TOXOPEUS, H. J.

On the influence of extra R-genes on the resistance of the potato to the corresponding P-races of *Phytophthora infestans*.

Euphytica, Wageningen 1957 : **6** : 106–10.

At Wageningen, Netherlands, no marked differences in degree of field resistance to race 3 of *Ph. infestans* were observed between plants which had the same ancestry and which were simplex, duplex and triplex with respect to R_3 for resistance to this race.

1830 ULLRICH, J.

Physiologic specialization of *Synchytrium endobioticum*.

Plant Prot. Bull. 1957 : **5** : 181–87.

Some account is given of the occurrence and spread of new biotypes of *S. endobioticum* in Europe; recent work on breeding resistant potato varieties is reviewed.

1831 COLE, C. S. & HOWARD, H. W.

The genetics of resistance to potato root eelworm of *Solanum tuberosum* subsp. *andigenum*, clone C.P.C.1690.

Euphytica, Wageningen 1957 : **6** : 242–46.

Investigations at the Plant Breeding Institute, Cambridge, England, have shown that resistance to *Heterodera rostochiensis* in the above clone is due to a single dominant factor, as in clones CPC1673 and CPC1685 [cf. XXIV, 2181 and XXVI, 505].

1832 ROTHACKER, D. & STELTER, H.

Beiträge zur Resistenzzüchtung gegen den Kartoffelnematoden (*Heterodera rostochiensis* Wollenweber). II. Untersuchungen über die Vererbung der Nematodenresistenz bei den Arten *S. vernei* Bitt. *et* Wittm. und *S. tuberosum* L. subspecies *andigena* (Buk.) Hawkes. [**Contributions towards breeding for resistance to potato eelworm (*H. rostochiensis* Wollenweber). II. Research on the inheritance of eelworm resistance in the species *S. vernei* Bitt. et Wittm. and *S. tuberosum* L. spp. *andigena* (Buk.) Hawkes**].

Züchter 1957 : **27** : 341–50.

Four clones of *Solanum vernei* and three of *S. tuberosum* spp. *andigenum*, which were of different origin and known to be heterozygous for eelworm resistance, were selfed and crosses were made with varieties of *S. tuberosum* spp.

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* ? *xitlense*.

tuberosum. In *S. vernei* the control of eelworm resistance appeared to be polygenic; for *S. tuberosum* spp. *andigenum*, it was confirmed that the inheritance of resistance is tetrasomic and depends on the dominant gene *H*.

1833 JONES, F. G. W.
Resistance-breaking biotypes of the potato root eelworm (*Heterodera rostochiensis* Woll.).
Nematologica, Leiden 1957 : **2** : 185–92.

The work of Dunnett with material obtained by hybridization of the clones *Solanum tuberosum* ssp. *andigenum* 'CPC1673', 'CPC1685' and 'CPC1690' with *S. tuberosum* was confirmed [cf. XXVII, 4164]. Tests were made with *Heterodera* cysts from several localities; these biotypes were found to vary in their ability to break down the resistance of the above crosses. Clone CPC1673 appeared to confer more resistance on its hybrid progeny than CPC1685 and CPC1690. The tests indicated that resistance tends to break down more in back crosses than in parent material and first crosses.

1834 SCHREIBER, K.
Natürliche pflanzliche Resistenzstoffe gegen den Kartoffelkäfer und ihr möglicher Wirkungsmechanismus. **(Naturally occurring plant substances conferring resistance to the Colorado beetle and the possible mechanism of their action).**
Züchter 1957 : **27** : 289–99.

In this review the author discusses in detail the nature of the alkaloids found in *Solanum* and *Lycopersicon*. It appears that alkaloids conferring resistance to *Leptinotarsa decemlineata* have a high polarity and affinity for steroids. If the alkaloids combine with steroids in the plant cells, essential nutrients may be rendered unavailable to the insect. Some alkaloids may also affect the physical properties of plant cells and so make them unpalatable to *Leptinotarsa*.

1835 ŚWINIARSKI, E.
Wpływ glikoalkaloidów występujących w *Solanum tuberosum* i *Solanum chacoense* na rozwój larw stonki ziemniacząnej (*Leptinotarsa decemlineata*, Say). **[The influence of glycoalkaloids occurring in *S. tuberosum* and *S. chacoense* on the development of the larvae of the Colorado beetle (*L. decemlineata* Say)].**
Roczn. Nauk rol. : Ser. A. : 1957 : **75** : 667–73.

Solanin obtained from *S. tuberosum*, *S. demissum*, *S. chacoense* and the hybrid Błękit [Blue] from *S. tuberosum* x *S. demissum* had an inhibitory effect on larval development. The effect was much slighter than that produced by demissin occurring in *S. demissum*.

1836 KASSANIS, B.
The use of tissue cultures to produce virus-free clones from infected potato varieties.
Ann. appl. Biol. 1957 : **45** : 422–27.

The study reported here has already been mentioned [XXVII, 3776].

1837 SCHICK, R. & SCHWEIGER, W.
Der Virusbesatz der in den Jahren 1948 bis 1955 in den Bezirken und Kreisen der Deutschen Demokratischen Republik erzeugten hohen Anbaustufen von Pflanzkartoffeln. **(The virus infection of the potato planting material of advanced generations of reproduction produced in the districts and regions of the German Democratic Republic in 1948 to 1955).**
Dtsch. Landw., Berl. 1957 : **8** : 1–27.

At the Institute for Plant Breeding, Gross Lüsewitz, samples of all potato stocks recognized in the German Democratic Republic as being élite, superélite, super-superélite or race élite, were examined for virus infection. Some widely-cultivated varieties such as Ackersegen, Mittelfrühe [Midearly] and Sieglinde suffered considerably from virus attack; the resistant varieties Aquila, Cornelia, Capella, Leona and Nova produced good quality potatoes, even in years which were favourable to virus attack.

1838 PFEFFER, C.
Das Auftreten der verschiedenen Viruskrankheiten der Kartoffel in der Deutschen Demokratischen Republik. **(The appearance of different virus diseases of potato in the German Democratic Republic).**
NachrBl. dtsch. PflSchDienst., Berl. 1957 : **11** : 136–44.

The occurrence of virus diseases on five varieties of potato grown in different parts of the German Democratic Republic is reported for the years 1951–53. Aquila was found particularly resistant to leaf roll; Mittelfrühe [Midearly] and Wega appeared resistant to virus A and virus Y respectively.

1839 JÄHNL, G.
Ergebnisse der Kartoffelversuche des Jahres 1956. **(Results of potato trials during the year 1956).**
VersErgebn. BundesVerAnst. alpenländ. Landw., Gumpenstein 1957 : No. 38 : Pp. 93. (Mimeographed).

Variety trials were conducted in several localities in the Austrian Alps. The information given, which is in tabular form, includes data on average yield, starch content, tuber size, and susceptibility to virus and other diseases.

1840 PASTOR COSCULLUELA, F.
Campos de experiencias. (**Experimental fields**).
ASPAS, Madr. 1957 : No. 24 : 8–11.
Information on the productivity during 1957 of potato varieties tested at Aranjuez and Talavera de la Reina and in Valencia, Spain, is presented.

1841 I, F., LIANG, H. & LIN, S.-C.
(**Studies on conversion in the sweet-potato variety Sheng-li 100**).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 27–41. [Chinese].
Sheng-li 100 [Victory 100], originally introduced from Japan, exists in two forms in northern China, with long and short vines respectively. The latter produces 30% more tubers and has a 2% higher dry-matter content than the former. The former type is believed to have arisen from the latter by "conversion".

1842 MILLER, J. C., HERNANDEZ, T. P., MIKELL, J. J. & FONTENOT, J. F.
Acadian, a new sweet potato variety.
Circ. La. agric. Exp. Sta. 1957 : No. 46 : unpaginated.
Acadian comes from the cross L 21 (Mameyita x L 4–6) x L 131 (Unit 1 Porto Rico x Pelican Processor). The roots are of uniform shape with a smooth copper skin and moist orange flesh. For early or late planting Acadian surpasses Unit 1 Porto Rico in yield; it is more resistant to soil rot than the latter and equally resistant to *Fusarium* wilt. Acadian keeps well in storage and has good baking and canning qualities.

1843 LAMBETH, V. N.
The Tango sweet potato.
Bull. Mo. agric. Exp. Sta. 1957 : No. 679 : unpaginated.
Tango (Nancy Hall x Porto Rico 1–10) was previously known as B4570 or Missouri X. It is recommended for its high yielding ability and good keeping quality; in appearance and table quality it surpasses Nancy Hall and Porto Rico. Tango is susceptible to *Fusarium* wilt and stem rot and is moderately resistant to *Ceratostomella fimbriata.*

1844 HASEGAWA, S. & NAKAYAMA, K.
(**Studies on the irrigation of fields. V. On the interrelations of variety, height of ridge, fertilizer application and amount of irrigation water on sweet-potato cultivation under irrigated conditions**).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1956 : No. 9 : 105–20. [Japanese].
Varietal differences are noted in respect of response to fertilizer level and to moisture content of the soil. Only some varieties are well adapted to growing in irrigated fields.

FIBRES

1845 **Cultivation of cotton in Russia. Phenomenal rise in yield recorded.**
Indian Cott. Gr. Rev. 1957 : **11** : 183–85.
A brief review is given of breeding methods used in Russia, where attempts are being made to produce varieties suitable for machine harvesting. Hybridization has produced varieties like S4507, S4517 and K1916 which have large bolls, high yields and good fibre length.

1846 RYŽOV, S. N.
(**Successes of Soviet science in the realm of cotton production**).
Agrobiologija (Agrobiology) 1957: No. 4: 14–28. [Russian].
An historical account of cotton growing in Russia from 1910 onwards, including a brief survey of the breeding work, is given. Among the varieties bred after the conclusion of the Second World War are (1) cottons which combine high yield, good fibre quality and greater earliness than 108F, (2) fine-fibred forms with a lint length of 37–38 mm. and 38–40 mm., (3) early fine-fibred varieties resistant to *Fusarium* and (4) a *Gossypium hirsutum* variety which shows resistance to *Fusarium* and *Xanthomonas malvacearum.*

1847 **Thirty-Fifth Annual Report of the Indian Central Cotton Committee for the year ended 31st August, 1956** : Pp. 133.

Genetics

Work on the inheritance of lint and fuzz colour continued [cf. XXVI, 2616]. Crosses were made with a view to studying the genetics of seed-fuzz intensity and spot size in Asiatic cottons. Transference of the lint genes of *Gossypium anomalum* to recessive lintless types of *G.*

arboreum and *G. herbaceum* is being attempted. Nineteen selections of (*G. arboreum* x *G. thurberi*) doubled x *G. hirsutum*, (Co.2 x 1027ALF) doubled and (Co.2 x *G. tomentosum*) x Indore 2 were tested against Malvi 9 and Indore 2. Four of these interspecific hybrids gave a promising performance.

Continuing the analysis of the response to selection for high and low values for halo length in hybrid material of *G. arboreum* [cf. XXV, 2843], it was found that progress in selection had not ceased by the F_{15} in the two crosses involving lines with high values and in the cross between lines having low values. Three categories of crosses with respect to halo length were made in the F_{11} of this material: high x low, within high and within low lines. F_3 genetic variability for this character was high in crosses between high and low lines and within low lines, further scope for selection being indicated.

Bombay

Virnar, Y–1 and W–81 were further selected for resistance to physiological shedding, in breeding *G. arboreum* cotton for the Khandesh tract. Selections were made for long and fine staple in the progeny of Virnar x Gaorani. Virnar was crossed with CJ73 from Amreli and 35–3 from Kanpur, both of which had been observed to possess some resistance to shedding. Crosses between Virnar and *G. arboreum* cottons from Coimbatore are undergoing selection. In a test at Poona, Dhulia–2 bulk showed immunity from wilt while progenies from 4G x Dhulia–2 sel., (*G. arboreum* from Madras x Virnar) x Dhulia–2 sel. and (7070B–14 x V)–6–8 were highly resistant.

Selections showing improvements over Kalyan in earliness, ginning percentage and fibre length have been developed in the scheme for improving Wagad cotton at Viramgam and Bavla.

In work on Mathio, progenies which appear to be superior to Pratap and the new strain CJ73 [cf. XXVII, 1970] in ginning outturn and fibre length have been obtained from crosses and back crosses of Pratap and Amreli selections with *G. arboreum* cottons from Coimbatore and elsewhere.

In the search for an improvement over Laxmi in the scheme on Dharwar-American cottons, material from crosses of black-arm and red-leaf resistant cultures of Indo-American types with Laxmi underwent selection. Subselections A–7 and B–2 of Laxmi were slightly superior to the parent variety in yield in large-scale trials.

F_1 hybrids of the *G. hirsutum* x *G. barbadense* cross, Co.4–B40 x Quebradinho, were tested in the scheme on perennial cottons at Dharwar. They had a mean halo length of 30·5 mm. and ginning outturn of 37% but were disappointing in yield. F_1s of crosses of the perennial drought-resistant variety Jahagirdar with the black-arm resistant types 2196BK, BC134–CW, XAB5, 125–Co.2–18, 170–Co.2 and Jinja gave high yields as second-year ratoons but their lint was coarse. Of the new F_1 hybrids planted, Gajjar white x 2087 and Gajjar white x G6 were promising.

The search for a strain superior to Jayadhar in earliness, yield and fibre qualities, for Bombay-Karnatak, continued with tests of strains of various origins; the local hybrid selection BC1 was again promising. Derivatives of crosses involving Kumpta types, *G. herbaceum* from Gujerat, Virnar and Gaorani were selected.

The Indo-American strains 170–Co.2 and 134–Co.2–M, the result of the programme of interspecific hybridization at Surat, were grown commercially in the Deccan Canals area [cf. *loc. cit.*]. Material consisting of Indo-American hybrids, *G. hirsutum* x *G. barbadense* derivatives, crosses *inter se* and crosses of the type annual-perennial shows promise of yielding strains with better fibre properties than 170–Co.2, together with high productivity and improved resistance to black arm. In order to impart resistance to pests and diseases and fibre strength and fineness to Indo-American selections, crosses have been made with wild species such as *G. tomentosum* and *G. anomalum*. In work on the exploitation of hybrid vigour for the production of cotton with extra long staple, hybrids within *G. hirsutum* and *G. hirsutum* x *G. barbadense* combinations were tested. BC68 x Sea Island proved to be the best, surpassing the control Co.2 x Sea Island in yield, ginning outturn and spinning performance. It is now to be tested on a large scale in cultivators' fields.

Progress was made in the scheme at Dharwar for breeding American cotton resistant to black arm, by finding types exhibiting a high degree of resistance, such as 134–Co.2–M–21–1 and 21–2 and BC–68–G4 from Surat.

Punjab

In work on American cotton for the south-eastern districts, some strains in the main trial exhibited better fibre properties and ginning outturn than 216F and H14. Particular mention may be made of AC79 with a mean fibre length of 1·02 in., Pressley strength index of 9·7 and 47 HSWC. In the scheme on Asiatic cotton for these districts, 231 Rosea has been established as superior to M60–A2 in yield and ginning outturn. It is proposed to distribute the former strain in those submontane parts of the state where the possibility of growing American cottons is limited.

In the main trial in the scheme on long-stapled American cotton, LL53 and LL54 outyielded the control 320F and had a fibre length of 1·13 in. and 1·09 in. respectively as against 0·96 in. for 320F. In tests on cultivators' holdings, these two strains, together with LL43, equalled 320F in yield. Tests in 1954–55 revealed LL43, LL45, LL48, LL51, LL54, LL55 and LL56 as being capable of spinning 50–58 HSWC, as against 39 counts for 320F.

In work on the development of American cotton for the central and submontane areas, strains at various stages of testing have shown improvements over 320F in one or more economic characters. Introduced types, particularly UK48, have combined well with local Punjab-American strains.

Madras

In improving long-stapled American cotton as a winter crop in the central districts, reselection 9030–G has given good results on cultivators' holdings. In the region of the west coast, Andrews showed promise of meeting the requirement for a Sea-Island variety having a high standard of lint quality and superiority to Montserrat in yield and ginning. A pilot scheme of testing F_1 hybrids (Sea Island x Cambodia) under commercial conditions was initiated.

G. hirsutum 'MCU–2' was released as an improvement over MCU–1. Selections from crosses of MCU–2 with the East African type Kampala surpassed MCU–2 in ginning outturn and fibre length. Sel.0484 (MCU–1 x 7727) and strains 119 and 0603, described as originating from MCU–2 x 7733 or Giza 36, showed promise in respect of fibre length but require improvement in maturity. Cultures L0440 and L0509 possessed a mean fibre length of 1·06 in., with a fibre maturity of 60% and 66% respectively.

In the main trial in the scheme on unirrigated Cambodia, strains 9080–8–5 [(G1 x Co.2)4–4–1–1], PK719 (a reselection of this cross) and PK485 gave a sufficiently good overall performance to merit further testing. Of the F_2 progenies studied, only one progeny (MCU–2 x 9030–8–5) combined high values in both lint length and ginning outturn.

In the improvement of Tinnevelly and Karunganni cottons, promising strains with a staple length of over 1 in. have been developed.

The American cotton P216F has shown itself to be the most suitable variety for off-season cultivation in rice fallows. Three reselections of P216F show potentialities as improvements over their parent in yield, halo length and ginning percentage.

Andhra

In the scheme for developing a white-linted *G. arboreum* cotton for the Northerns tract, tests of strains showing possible improvement over N14 in lint quality continued. In trials at several centres, 5975, 5289 and 6224 were better than Local and N14 in this respect. In work on white-linted cotton for the Cocanadas tract, varieties found promising, such as B32.48/51, K28, 3943B, 122, Pratap, 197–3 and a few Gaorani types, were used in hybridization to improve earliness, adaptability, staple length, ginning outturn and spinning capacity.

Madhya Pradesh

In the main trial of Asiatic cottons, 13A and B12A showed promise in ginning percentage, fibre length and spinning performance. Of the varieties of American cotton tested at four centres, 0296–7 surpassed the control B0394 in yield, halo length and ginning outturn while another type, 147, was superior to the control in halo length and ginning percentage. In progeny-row trials of American cotton, 16 cultures combined resistance to black arm and jassid with desirable economic characters.

Uttar Pradesh

In work on the improvement of Asiatic cotton for the western and central regions, a derivative of 35/4 x Parb. G703 and another of C520 x C402 compared favourably with 35/1 in yield in tests on government farms. Strain 51/50, tested in the main trial, was found to be capable of spinning 19s HSC; it is to be further improved in yield. Of the derivatives of 197–3 x 35/1 and 197–3 x C520 tested in the preliminary trial, six were significantly better than 35/1 in halo length.

Strain trials at Nagina, Hempur and Kiserwa continued the scheme to develop Asiatic and American cottons in the Rohilkhand Tarai area. Selections of 35/4 x Parb. G703 and (35/6 x G4 M–11) x 35/6 were noteworthy for superiority in quality over 35/1 in certain trials.

Assam

The scheme for the development of improved short-stapled strains continued. None of the strains tested in district trials was however an improvement over the local cotton in yield and ginning outturn.

Hyderabad

Strain 2204, an advance over Gaorani 12 in the Parbhani district, has been named Daulat. New strains superior to Daulat in quality were late maturing and not highly productive, while those better than Daulat in yield tended to have increased fibre weight. PII–45–2513, PII–47–3591 and N1422 were tested in district trials in Aurangabad and Bhir, against Gaorani 12, 197–3 and the local type. PII–47–3591 again gave high yields. In the main trial at the research station, these three new strains equalled Gaorani 12 in spinning capacity but did not compare favourably in ginning percentage with 197–3, a strain popular among cultivators on account of its high ginning outturn, although low in yield.

Pepsu

The new selection 320F/35 of the American cotton 320F showed improvements in yield, ginning outturn and jassid resistance.

Mysore

Of the strains tested in the main trial of Upland, three were superior to MA.V in halo length and spinning count while being equal to it in yield and red-leaf resistance.

The Cambodia type 2196–4 maintained its good performance under irrigated conditions in the Bellary district. It has also shown promise in its first year of trial under unirrigated conditions. Hybridization was undertaken to develop Cambodia types resistant to jassids, thrips and black arm. In addition, adaptable types were crossed with high-quality varieties such as MCU1, MCU2, Ingold and IVG to improve staple length and fineness.

In the district trials of Westerns cotton, strains 2–3–68 and 2–3–69 were superior to Westerns 1 in staple length and ginning outturn and equal to it in yield. Material at a less advanced stage of breeding and testing also included entries surpassing Westerns 1 in two or more properties.

Rajasthan

Some of the American strains tested under irrigated conditions in Mewar were superior to Indore 1 in one or more respects. In the main trials of *G. arboreum* strains for rainfed conditions in this tract, 35/1 was noteworthy for its superiority over the local type in yield, earliness and fibre length.

Madhya Bharat

Investigations at the Institute of Plant Industry, Indore, have been referred to above under *Genetics*. In addition, mention is made here of the F_1-hybrid selection CTI4–22 of Quebradinho x *G. tomentosum*, which combined good yield with a halo length of 31 mm. and ginning outturn of 39%.

The superiority of Maljari over all other *G. arboreum* strains for the Nimar tract was confirmed. In breeding to develop strains equal to Maljari in yield and to Virnar in ginning percentage, bulk progenies of Maljari x Jarila and Jarila x Bhoj were selected. The American cotton A51–9 has given a good performance in this tract, surpassing 0394 in yield of seed cotton and lint and in ginning outturn.

Of the types tested in the scheme of breeding long-stapled American cotton at Badnawar in the Dhar district, CTI hybrids [(Co.2 x *G. tomentosum*) x Indore 2] gave the best performance, followed by hybrids involving *G. thurberi*. The CTI hybrids surpassed the control Indore 2 in earliness and halo length and are considered to be as adaptable as Asiatic cotton to adverse conditions. Two of them, CTI1–1 and CTI1–3, also had higher ginning outturn than Indore 2. Twenty-six of 64 progenies derived from *G. hirsutum* x *G. barbadense* x *G. hirsutum* combinations involving parents such as Sea Island V135, Early Pima, Sakel, Malaki and Menoufi were retained for further study.

Orissa

In trials during the rainy season, Buri 0394, MCU1 and Parbhani American showed promise under irrigated conditions. Together with Laxmi, Buri 0394 and Parbhani American also gave a good performance without irrigation. Of the perennial types tested, Quebradinho was the most productive. Crosses between this type and MCU1, MCU2, M4 and 170–Co.2 were effected. A survey of the cottons in the Bolangir district was undertaken.

1848 **Review of work done under the committee's schemes for the year 1955-56.**

Indian Cott. Gr. Rev. 1957 : **11** : 408–29.

The emphasis of this summary of the work carried out by the Indian Central Cotton Committee during 1955–56 is laid upon the results of varietal trials and agronomic investigations [cf. 1847].

1849 Sethi, B. L. & Dharmarajulu, K.

Indian cotton—its past, present and future.

Indian cent. Cott. Comm. 1957 : Pp. 54.

This survey includes an outline of the achievements of the Indian Central Cotton Committee in producing improved varieties adapted to Indian conditions.

1850 Kalyanaraman, S. M. & Santhanam, V.

A review of recent trends in cotton breeding technique.

Indian Cott. Gr. Rev. 1957 : **11** : 131–35.

New methods of selection are described with special reference to those used at Coimbatore. Open pollination and bulk methods of breeding are becoming popular as means of increasing genetic variability.

1851 Kalyanaraman, S. M.
Review of cotton research in Madras state under the auspices of schemes financed by the Indian Central Cotton Committee during the past thirty years.
Indian Cott. Gr. Rev. 1957 : **11** : 329–39.

In this review some unsolved problems of breeding technique are mentioned, such as how American Upland types may be further used for improving Madras American types and whether it is better to use a small number of F_1s in hybridization work in preference to large-scale crossing.

1852 Bederker, V. K.
Improvement of Hyderabad Gaorani cotton.
Indian Cott. Gr. Rev. 1955 : **9** : 1–23.

This survey of the work of the Gaorani Cotton Improvement Scheme in Hyderabad, India, from 1929 to 1949 describes the development of the improved variety Gaorani–6 from local Gaorani and the subsequent production of early-maturing strains of Gaorani–6 and other varieties of superior fibre quality with resistance to *Fusarium* wilt. Three strains almost homozygous for complete resistance to wilt have been developed at Poona.

1853 Puransingh Sangwan
Cotton improvement in modern Egypt. I. Cotton breeding.
Indian Cott. Gr. Rev. 1957 : **11** : 93–100.

Egyptian breeding techniques and the methods used in seed production and testing are briefly described.

1854 Ter-Avanesjan, D. V. & Procenko, N. G.
(**Geographical variation of specimens from the world collection of cotton and their hybrids**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. **3** : 154–77. [Russian].

When grown for two years in three different localities varying in altitude from 285 to 980 m. most varieties showed differences in morphological features, some more than others; some varieties, such as 108–F, gave satisfactory yields in all three places whereas variety 45 did well only at the lower and many early-maturing varieties only at the higher altitudes.
Similar observations on hybrids obtained by intercrossing 20 varieties of *Gossypium hirsutum* showed that all F_1 and F_2 hybrids matured earliest at the lowest altitude.
Details are given showing the effect on the progeny of growing seed in different sets of conditions.

1855 Lewis, C. F.
Interaction of genes for round leaf and frego bract in cotton.
J. Hered. 1957 : **48** : 169–72.

The above mutant genes, *rl* determining round leaf and *fg* frego bract, were found to act as recessives when studied separately or when heterozygous in the same plant. When a plant is homozygous for round leaf and heterozygous for frego bract the smaller bract associated with *rl* may be narrowed and twisted to show the frego bract phenotype. This is interpreted as a loss of dominance of *Fg* in a genetic background homozygous for *rl*.

1856 Eaton, F. M.
Selective gametocide opens way to hybrid cotton.
Science 1957 : **126** : 1174–75.

Experiments at the College of Agriculture, University of California, Riverside, have indicated that spraying with sodium α,β-dichloroisobutyrate and salts of other chlorinated organic acids may induce male sterility and is thus of possible use in the production of F_1 hybrid seed. Varietal disparities were noted in the general toxic effects and degree of sterility caused by the different compounds and by different doses of the same compound.

1857 Kaiwar, S. R. & Kubsad, S. C.
A note on the new method of producing hybrid seeds.
Indian Cott. Gr. Rev. 1957 : **11** : 195–97.

Gossypium hirsutum 'Laxmi' releases its pollen later in the day than *G. barbadense* 'V135' under Dharwar conditions. Hence it was found possible to produce Laxmi x V 135 hybrids without emasculation of Laxmi flowers. Data are provided to show that these hybrids are promising in respect of yield and quality.

1858 Santhanam, V., Marappan, P. V. & Sennayan, P.
A new entire leaf mutant in *G. arboreum* L.
Sci. & Cult. 1957 : **23** : 197–98.

A few plants of Karunganni 9751, whose leaves are normally deeply laciniate, were found at Kovilpatti, Madras State, to have almost all their leaves entire. Genetic studies are in progress.

1859 NEGI, L. S. & SEHGAL, S. L.
Improved strains of Punjab American cotton. II. 320 F.
Indian Cott. Gr. Rev. 1957 : **11** : 104–110.

Data are provided to show that the above variety is superior in yield to the mother strain LSS and to short-stapled desi cotton. 320 F excels LSS in ginning percentage, fibre properties, early maturity and adaptability to a wide range of environmental conditions.

1860 **A guide to Indian cottons.**
Indian Cott. Comm. 1956 : Pp. 74.

This guide provides details of the areas covered, yields produced between 1950 and 1955, the spinning performance and other characteristics of the cotton varieties grown in India, divided into twelve major groups, namely Bengals, American, Virnar, H420, Oomras, Hyderabad Gaorani, Malvi, Broach-Vijaya, Surti-Vijalpa (2087), Dholleras, Southerns and Comillas.

1861 **Cotton on the march.**
Indian Fmg. 1957 : **7** : No. 7 : 15–16.

A new strain of cotton, 6186–9, has been developed for the Tinnevellies and Karunganni districts. It is superior to K2 and K5 in yarn strength, staple length, ginning outturn and lint yield.

1862 WADDLE, B. A.
Rex, a new Arkansas Cotton.
Arkans. Fm. Res. 1957 : **6** : No. **3** : p. 5.

Rex was developed by crossing BBR3–15–12 with Empire WR and then back crossing to the latter. It is early maturing, high yielding and resistant to *Fusarium*, *Xanthomonas* and storm loss. The ginning capacity is higher than that of either parent.

1863 RAO, B. S.
***Raichur barbadense*: a desirable perennial cotton.**
Mysore agric. J. 1957 : **32** : p. 115.

The above local perennial cotton has given a good performance at the Raichur Farm, Mysore. It has a staple length of 1·27 in., a maximum spinning value of 60 warp counts and resistance to insects and pests. Hybridization of this cotton with Laxmi and other annual forms to develop a variety with extra long staple for the area of the Tangabhadra Project is under way.

1864 FINLEY, L. & SELF, F. W.
Some facts about the fiber quality of Stardel cotton.
Circ. La. agric. Exp. Sta. 1956 : No. **44** : Pp. 3.

Information is given on the fibre quality and performance during processing of Stardel cotton produced in Louisiana [cf. XXVII, 701].

1865 MEMON, A. M.
A study of cytological and morphological segregation in "Fl" three species hybrids derived from hexaploid x diploid crosses of *Gossypium*.
Agriculture, Pakistan 1956 : **7** : 316–21.

The study reported here was carried out with hybrids involving *G. arboreum*, *G. hirsutum* and *G. harknessii* at the Texas Agricultural Experiment Station. Evidence is presented indicating the translocation of relatively long segments of chromosome arms, preferential pairing in hexaploids and the occurrence of deficiency duplications. The hybrids showed a wide range of morphological variation and all triploids were sterile, while hexaploids showed 30 to 36% fertility.

1866 KAMMACHER, P. A., BROWN, M. S. & NEWMAN, J. S.
A quadruple monosomic in cotton.
J. Hered. 1957 : **48** : 135–38.

A morphologically abnormal plant of *Gossypium hirsutum* introduced from Mexico has been found at College Station, Texas, to be lacking four large chromosomes, probably of the A genome. The plant is vigorous but sterile and it is suggested that either no genes for viability are located on the missing chromosomes or that they are compensated for by duplication in the D genome.

1867 YEH, T.-Y.
(Cotton shedding and its control).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 42–58. [Chinese].

Chinese research on cotton shedding is reviewed. Brief allusion is made to interspecific and intraspecific differences in shedding percentage.

1868 SIMONGULJAN, N. G.
(The effect of pollination conditions upon selectivity of fertilization in intervarietal crossing of cotton).
Agrobiologija (Agrobiology) 1957 : No. 2 : 31–34. [Russian].

Experiments at Taškent showed that preference by a mother plant for a definite kind of pollen depended on the mode of pollination. A variety fertilized by self pollen + foreign pollen preferred the latter, but the opposite effect was produced when pollen from other plants of the same variety as the seed parent was used instead of self pollen. Pollination of a variety by two fractions separated by 20 min., 30 min., 1 hr. or 2 hr. intervals mainly gave progenies resembling the second pollen parent. A variety pollinated with mixed pollen on the day preceding flowering, when the stigma was still immature, or on the first day of flowering, preferred self pollen to that of another variety; the preference was reversed two days after flowering. No shift towards preference for foreign pollen was observed if a variety was pollinated by *Hibiscus syriacus* on the first day of flowering, as a preliminary to mixed pollination of aging stigmas. In mixed pollination of such varieties as 108F or S1470, in which the pollen of one component was fresh and the other stale, the fresh pollen was normally preferred. An exception was provided by 108F x 108F (stale) + 10964 (fresh) where the stale pollen was preferred. Experiments on the use of a large amount of pollen from one component and a small amount from the other had variable results. For instance, only a slight increase in the percentage of maternal types occurred in the progeny of 108F x S4717 + 108F when 30 times as much 108F pollen was used as of S4717F, while a reversal of the ratios very substantially raised the percentage of hybrid offspring. A higher percentage of maternal types occurred in the progeny of 137F x Krasnolistnyj Akala [Red-leaved Acala] + 137F when the amounts of pollen of the two components were equal than when the amount of 137F pollen was larger.

1869 NEGI, L. S. & AJAIB SINGH AUJLA
Inheritance of pollen colour in crosses between Punjab American and South Rhodesian *hirsutums*.
Indian Cott. Gr. Rev. 1957 : **11** : 281–84.

Five Southern Rhodesian Upland types with yellow pollen were crossed at Abohar with 189/51 which has creamy white pollen; the latter is derived from the cross 199F x Wild's strain. Studies of F_1, F_2 and F_3 generations indicated that the above types differ by one factor controlling pollen colour and that yellow is dominant to creamy white. In crosses involving G4711 and 4714 the F_2 progeny showed a ratio of 1 : 2 : 1 for deep yellow, yellow and creamy white pollen; some deviation from this ratio was found in crosses involving G479, 4716 and 4725 and this may be due to the action of modifying genes.

1870 ENDRIZZI, J. E.
The cytology of two hybrids of *Gossypium*.
J. Hered. 1957 : **48** : 221–26.

Some morphological characters of the F_1 hybrids of *G. hirsutum* with *G. aridum* and *G. lobatum* were compared with those of the parents; details of chromosome pairing in the hybrids are reported. *G. hirsutum* has the A and D genomes and the two diploids have the D genome; it is thought that *G. lobatum* should be placed in a genome category of its own, D_7. Pairing of A and D chromosomes in the trivalents is considered to be due to residual homology; chiasma seemed to occur in the terminal regions of the chromosome arms.

1871 CĂRPINIŞAN, T.
Obţinerea plantelor de bumbac cu ramuri simpodiale limitate. (**Production of cotton plants with limited sympodial branching**).
Comun. Acad. Romîn. 1955 : 1513–17.

By crossing within the family derived from a hybrid obtained by crossing two cottons from Pietroşani, cottons have been obtained with inflorescences with a single internode bearing 1–3 bolls. Selections of this type have been made which show improvements in fibre length compared with the initial material.

1872 WANG, F.-H. & CHIEN, N.-F.
(**The early stages of development of cotton endosperm**).
Chi-wu-hsueh Pao/Act. bot. sinica 1957 : **6** : 29–37. [Chinese].

Nuclear behaviour in cotton endosperm is described. Nuclear division is mainly mitotic but various types of amitosis also occur. Nuclear fusion was also observed, resulting in polytriploid nuclei.

1873 MEYER, J. R.
Origin and inheritance of D_2 smoothness in upland cotton.
J. Hered. 1957 : **48** : 249–50.

It was found that D_2 smoothness is due to a single dominant gene *Sm*, which has been transferred from a wild American species, *G. armourianum*, to Upland cotton; *Sm* is in the D subgenome.

1874 HARIRAS NAVKAL & RAJARAMAN, S.
Importance of Pressley strength index as a measure of tensile strength of cotton fibres.
Indian Cott. Gr. Rev. 1957 : **11** : 117–20.

Tabulated data are provided showing the intrinsic strength, Pressley strength index and other important characters of 28 Indian varieties.

1875 **Wiping out long staple cotton imports—is it possible?**
Indian Cott. Gr. Rev. 1957 : **11** : p. 202.

Of the long-staple strains tested in the Punjab, LL56 was found most promising with respect to spinning capacity. In Mysore the Egyptian Giza 7 and Giza 12 were found to have spinning capacities of 65 to 70s HSC; Andrews, which has a similar capacity, appears to be the best of the Sea Island varieties.

1876 **Oil content values of cotton seed samples from various states determined at the technological laboratory, Matunga, during 1955-56.**
Indian Cott. Gr. Rev. 1957 : **11** : 435–38.

The oil content is recorded for a large number of varieties of *Gossypium arboreum*, *G. herbaceum* and *G. hirsutum*.

1877 Iyengar, R. L. N.
Technological reports on standard Indian cottons, 1956.
Technol. Bull. Indian Cott. Comm. : Ser. A. : 1957 : No. 92 : Pp. 108.

This bulletin provides a report of tests on the fibre properties and spinning performance of samples of 22 varieties chosen as standards from the 1955–56 crop [cf. XXVII, 4191].

1878 Minko, D., Kanaš, M. & Turks, L.
(**Ways of improving the fibre quality of Soviet cotton varieties**).
Hlopkovodstvo (Cott.-raising) 1957 : No. 10 : 33–37. [Russian].

Many varieties with good-quality fibre have been obtained recently in the USSR. The breeding techniques include Mičurinist training and interspecific hybridization. Technological analyses of the most recent selections have been carried out at the Cotton Institute and tabulated information on length of staple, gauge, fibre strength, breaking length of fibre and ginning percentages is given. The new fine-fibred varieties 157F, S4744 and S9029 have fibre 36·1–39·3 mm. long and are more productive, especially in northern districts, than the fine-fibred varieties of *Gossypium barbadense*. The new varieties outyield 108F, and have high ginning percentages. New mélange types such as S5501, S9051, S1625 and S4769 produce fibre of superior quality to S450–555 and 137F.

1879 Seshadri Ayyangar, G. & Venkoba Rao, M.
Review of the salient achievements in the Mungari cotton improvement scheme, Adoni.
Indian Cott. Gr. Rev. 1957 : **11** : 251–56.

This review covers the work done in 1937–55. Data are provided on the performance of some promising selections. The strain 3943B (2159 x Jarila) is equal to Mungari Local in earliness and superior in yield, staple length and ginning percentage; it compares well with H420; 5243 has a staple length of nearly one inch and a higher yield than local Mungari; it is finer than 3943B.

1880 Avtonomov, A. I. *et al.*
(**An eminent scientist and cotton breeder**).
Hlopkovodstvo (Cott.-raising) 1957 : No. 11 : 60–62. [Russian].

This biography of the late G. S. Zajcev, signed by his former colleagues, mentions some results of breeding new cotton varieties for Turkestan. These included 1838 and 1876, said to be the first varieties combining earliness with good technological properties.

1881 Limaye, M. R.
Inheritance of fiber density in a hybrid between Upland and Sea Island cotton.
Diss. Abstr. 1957 : **17** : Publ. No. 18,739 : p. 470.

The inheritance of seed index, lint-density index, lint index and lint percentage was investigated in three crosses of Upland with Sea Island cotton. High seed and high lint indexes were dominant. A considerable degree of hybrid vigour was expressed in respect of seed index, with the main consequence of a higher mean lint index in the F_1. Dominance did not affect lint-density index. In two crosses low lint percentage was partially dominant. Except in the case of lint index, no transgressive segregation was detected. Although inherited in a typically quantitative manner, seed and lint-density indexes appeared to depend upon relatively few genes. Heritability values for all the characters studied were relatively high, the value for lint percentage being of the greatest magnitude. Seed and lint-density indexes were not associated. Highly significant positive associations were found between lint-density index, lint index and lint percentage. Seed index was negatively correlated with lint percentage but the association was not high as the result of the influence of lint-density index. Seed and lint indexes were positively correlated. The association between lint index and lint percentage was positive and complete when seed index was held constant but was negative with lint-density index as a constant.

1882 Kalyanaraman, S. M. & Santhanam, V.
A note on the performance of some inter-specific hybrids involving wild species of *Gossypium*. I. *Arboreum-anomalum* crosses.
Indian Cott. Gr. Rev. 1957 : **11** : 136–40.

The low fibre weight of *G. anomalum* was found to be inherited as a dominant character in the cross *G. arboreum* x *G. anomalum* and in second back crosses to cultivated strains. The fibre properties of F_1 and back-cross generations are compared in detail with those of the parents. The possible use of *G. anomalum* for transferring low fibre weight with high fibre maturity to cultivated strains of *G. arboreum* is discussed.

1883 PANDYA, P. S. & MAJMUDAR, P. N.
Wilt-resistant cotton for South Gujarat Cotton Tract.
Indian Cott. Gr. Rev. 1957 : **11** : 399–401.

This is an account of the work which led to the development of the wilt-resistant strain 2087, released as Vijalpa. Further selections of 2087, the cross 2087 x 2334 and crosses between 3652 and long-stapled Persian derivatives are being studied for wilt resistance.

1884 PHADNIS, B. A.
A new cotton for the Mathio tract of Kathiawar.
Indian Cott. Gr. Rev. 1957 : **11** : 236–42.

CJ73 was selected from the cross C520 x Jarila. In trials in Saurashtra State, it surpassed Pratap in yield, drought resistance, fibre properties and spinning; the ginning percentage equals that of Pratap and the bolls open earlier. The resistance to *Fusarium vasinfectum* is superior to that of other Amreli strains.

1885 MÉNDEZ R., E. D.
Mejoramiento del algodón Tangüis. Campaña 1955–56. (**Breeding Tangüis cotton. Season 1955-56**).
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 360 : 8–18. (Mimeographed).

The best lint yields of the season were those of lines LMW1877–50, LM1041–49, SNA251 and SNA28WT, between which there was no significant difference. LMW lines exhibited resistance to wilt (*Verticillium albo-atrum*) and lower yield losses from disease. Among the progeny of selections made on the basis of resistance to wilt or root rot (*Thielaviopsis basicola*), or both, LWMI–52–55 and LMWII–52–55 showed promise. Seventeen plants of the line LM1041–49, which were not attacked by nematodes, are to be studied in the coming year [cf. XXVII, 4197].

1886 BEDERKER, V. K.
Scope for further improvement of Hyderabad Gaorani cotton.
Indian Cott. Gr. Rev. 1957 : **11** : 152–58.

At Nanded, new strains of Gaorani have been produced which are superior to 1422, 1494, 1585 and 1946 in respect of fibre length, strength and fineness, ginning percentage and wilt resistance. It is thought that an extra-long stapled variety with a ginning percentage of 40 could be produced from these strains.

1887 APPA RAO, P.
The future cotton problems of Tungabhadra Project Area.
Indian Cott. Gr. Rev. 1957 : **11** : 320–28.

The breeding of a long-linted type suitable for the above area is discussed. Recent progress in breeding for resistance to thrips and black arm and for high maturity of kapas and fibre is described.

1888 CĂRPINISAN, T. *ET AL.*
Contribuţii la raionarea soiurilor de bumbac în R.P.R. (**Contributions to the regionalization of cotton varieties in the Rumanian People's Republic**).
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 305–48.

Nine varieties from Bulgaria, Rumania and the USSR were tested at seven locations. Data are provided on yield, fibre quality and vegetative period and recommendations are made on varieties suitable for the different regions of Rumania.

1889 **C.J.73—an outstanding new cotton for the Mathio tract of Kathiawar.**
Indian Cott. Gr. Rev. 1957 : **11** : 203–204.

CJ73 (C520 x Jarila) has proved superior to Pratap in yields and quality and is adaptable to the soil and climatic conditions of southern Kathiawar [cf. 1884].

1890 LEWIS, C. F. & RICHMOND, T. R.
The genetics of flowering response in cotton. I. Fruiting behavior of *Gossypium hirsutum* var. *marie-galante* in a cross with a variety of cultivated American upland cotton.
Genetics 1957 : **42** : 499–509.

The cross used in these studies at the Texas Agricultural Experiment Station was between *Gossypium hirsutum* var. *marie-galante* and *G. hirsutum* Deltapine 14, the former being a short-day plant and the latter day neutral. All F_1 plants produced flower initials under long days but only 49% reached flowering and these produced only one or two flowers. In each back cross the recurrent parent tended to be dominant, indicating that the genetic background of each strain strongly influenced the expression of the genes controlling time of flowering. Under short-day conditions all plants flowered. Segregation in the F_2 did not reveal a simple genetic ratio, nor was the segregation typical of quantitative inheritance.

1891 SENČENKO, S. I. & NEVINNYH, V. A.
(Wide crossing in breeding hemp and kenaf).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : 12–17. [Russian].

Descriptions are given of the first and second generations of hybrids of southern varieties of hemp pollinated by a mixture of varieties from northerly latitudes and of some promising selections from them. Several of these mature earlier than the parents and the standard varieties and exceed them in seed yield by up to 20% and in fibre yield by up to 7%.

No hybrids were obtained in crosses of *Hibiscus cannabinus* with *H. trionum*, *H. esculentus*, *H. manihot* or *H. sabdariffa* but crosses have been made of *H. cannabinus* with an unidentified species from Angola, referred to as Hibiscus 451; the hybrids were vigorous, with pronounced short-day reaction, but their flowers were sterile. A second species from Angola, referred to as Hibiscus 449, was crossed with *H. sabdariffa* and the hybrid, when crossed with *H. cannabinus*, gave rise to a triple hybrid bearing characters from all three species, which was however also sterile.

Hybrids have also been obtained by crossing cultivated *H. cannabinus* with wild forms from south and south-west Africa; they segregated for spines in the F_2 but no completely spineless segregate occurred; some segregates had indehiscent capsules; no hybrids of any practical interest appeared. In this respect the most promising were hybrids between cultivated forms of widely different provenance, which gave rise to some early types with very rapid development in the early growth phases, indehiscent capsules and large seeds. Marked heterosis occurred when early-maturing forms were crossed with other early, with late or with wild forms; from a cross of two ultraearly short forms, 3237 and G2978, followed by four generations of selection, the variety Kuban' 333 has been produced; it is distinguished by high yield and fibre percentage and is suitable for the Uzbek and Kirgiz SSR.

1892 JAKUŠKIN, I. V. & ORLOV, V. T.
(The flax variety L1120).
Lën i Konoplja (Flax & Hemp) 1957 : No. 7 : 17–19. [Russian].

L1120, which was bred at Smolensk, lodges less than Svetoč [Torch], and other Soviet standards. It is highly productive of seed and fibre and shows resistance to pests and diseases, in particular *Fusarium*. In recent trials it yielded 4 c. more seed and 0·8 c. fibre per ha. than Stahanovite in the province of Gor'kij and was also more productive than the other standards at Pskov, Mogilev and Jaroslavl'. The principal shortcoming of L1120 is poor quality fibre.

1893 KLEYBURG, P. L.
Origins of white-flowering flax in the Netherlands.
Euphytica, Wageningen 1957 : **6** : 224–26.

Information is given on the origin and subsequent history of Friesian white-flowered flax which, it is shown from documentary evidence, was collected in 1816 by a farmer named G. G. Bijlstra, and not by G. Jensma, as stated by de Haan [cf. XXIII, 2079].

1894 SOFINSKAJA, V. J.
(A form of flax with six locules).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. 3 : p. 42. [Russian].

Hybrids of the flax Tekstil'ščik [Textile Worker] show a pronounced tendency to produce plants with ovaries and capsules having six locules; by selection for this type a population was formed in which 60–70% of the plants had six and some had seven locules.

1895 ŠUŠKIN, A. A.
(Newly-bred varieties of fibre flax).
Lën i Konoplja (Flax & Hemp) 1957 : No. 7 : 21–24. [Russian].

Tabulated information on yield, fibre extraction, technological worth and resistance to lodging, *Melampsora*, *Fusarium* and *Polyspora* of new varieties bred at the Flax Institute and the Tomsk, Pskov, Smolensk and the Lithuanian research stations is provided. It appears that most of the new varieties are interesting on account of high fibre yield and fibre-extraction rate. Some were productive of seed, too, and 17, from the Flax Institute, was free from lodging and B186, from Pskov, produced fibre of high quality.

1896 PLONKA, F.
Les groupes géographiques de lin. **(The geographical groups of flax).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : 7 : 109–38.

The following fundamental groups of *Linum usitatissimum* are distinguished: Mediterranean, Eurasiatic and Indo-abyssinian. These groups and their principal subdivisions are described and the general performance of some fibre and seed varieties is discussed; data on yield have been compiled from the literature. A list of genes which control flower and seed colour is provided.

1897 Flor, H. H.
Genic systems in flax and the flax rust fungus.
Robigo, Castelar 1957 : No. **4** : 2–5; also in Spanish. (Mimeographed).

The author describes his theory that each gene governing rust reaction in the host interacts with a specific gene for virulence in the pathogen [cf. XXV, 1256]. The 25 genes known to condition the host reaction occur as alleles at five loci; genes at two of the loci are linked. Each race of rust is thought to possess 25 loci controlling pathogenicity and at least 12 genes or groups of genes appear to be independently inherited. "The occurrence of single pairs of incompatibility genes renders the host resistant". Most of the host genes condition either high resistance or high susceptibility to all races of the rust; other genes vary the response to different races.

1898 Il'ina, P. R.
(**Production of new forms of flax by intravarietal selection**).
Agrobiologija (Agrobiology) 1957 : No. **4** : 151–53. [Russian].

Data showing intravarietal variability with regard to most economic characters in such varieties as 1288_{12}, I7 and I9 at a seed nursery in Toržok are presented. The changes, attributed to external conditions, are thought to make intravarietal selection worth while. This view is vindicated by an account of the selection of the variety Želtosemjannyj [Yellow-seeded] from Svetoč [Torch] and I9–717 from I9. Želtosemjannyj is distinguished from the mother variety by its seed colour and improved quality of fibre; in all other physiological and morphological properties it is the same. I9–717 is characterized mainly by a higher degree of resistance to *Fusarium* than I9.

1899 Feaster, C. V.
Genetic and environmental variability of percent fiber and other characters in monoecious hemp, *Cannabis sativa* L.
Text. Quart. 1957 : **6** : 43–47.

In a monecious strain developed by several generations of sibbing monecious plants selected from the diecious variety Kentucky, the correlations between fibre percentage on the one hand and stem weight, stem diameter and weight/diameter ratio of the stem were negative. Heritability of fibre percentage was high, of the other characters negligible.

1900 Ganesan, A. T., Shah, S. S. & Swaminathan, M. S.
Cause for the failure of seed-setting in the cross *Corchorus olitorius* x *C. capsularis*.
Curr. Sci. 1957 : **26** : 292–93.

Abortion of young embryos from the above cross is attributed to poor development of the endosperm. Attempts are being made to culture young embryos *in vitro*.

1901 Czaja, A. T.
Probleme der Massenvermehrung der Faser-Yucca-Pflanzen. (**Mass-propagation problems of *Yucca* fibre plants**).
Mater. veg. 1957 : **2** : 219–52.

Vegetative and sexual propagation of *Yucca* is discussed. In general more viable seed is produced by cross pollination than by self pollination; large seeds were found to germinate in greater numbers than smaller seeds and marked differences were found between individual plants with respect to the production of good seed. The European fibre plants are thought to be *Y. filamentosa* x *Y. flaccida* hybrids; this may explain the variability in form shown by sexually produced progeny.

1902 Bernardo, F. A.
Plant characters, fiber, and cytology of *Musa balbisiana* x *Musa textilis* F_1 hybrids.
Philipp. Agric. 1957 : **41** : 117–56.

These hybrids showed considerable variability in all characters studied; the fibre was inferior to that of *M. textilis*. The plant characters were intermediate between those of the parents and resembled those of canton, which may be a hybrid of the same species. The clones studied showed complete female sterility and two kinds of male sterility. An illustrated account of meiosis in these hybrids is provided; the chromosome number is 21.

1903 Toyama, S., Ando, M. & Kurose, H.
Studies on the paper mulberry-IIII. Classification of paper mulberry (*Broussonetia* spp.) races by means of spodograms of the leaves.
Mem. Fac. Liberal Arts Educ. Miyazaki Univ. 1957 : No. **1** : 81–95.

Spodograms of the 16 Japanese varieties were studied; by their means the varieties could be classified into 5 groups. Two of the groups corresponded to what are regarded as typical *B. papyrifera* and *B. kazinoki* but the other three were in various degrees intermediate.

1904 KRAPOVICKAS, A.
Números cromosómicos de Malváceas americanas de la tribu Malveae. **(Chromosome numbers of American Malvaceae of the tribe Malveae).**
Rev. agron. Noroest. argent. 1957 : **2** : 245–60.

Chromosome numbers are presented for 42 species from various parts of North and South America. In *Abutilon* all species examined were diploid, except *A. grandifolium* (*A. molle*), which had $2n = 42$ and could thus be distinguished easily from *A. pauciflorum*, which it closely resembles morphologically, with $2n = 14$. Diploid species with both $2n = 14$ and 16 were found.

1905 SCHVESTER, D. & BIANCHI, H.
Cryptorrhynchus lapathi L. (*Coleoptera Curculionidae*), ravageur des osiers cultivés. **[*C. lapathi* (Coleoptera Curculionidae), a ravager of cultivated osiers].**
Ann. Inst. nat. Rech. agron., Paris : Sér. C. : 1957 : **8** : 137–51.

It was noted at Verpillière, that *Salix americana*, Purvim (*S. purpurea* x *S. viminalis*) and *S. triandra* 'Black Maul' are attacked by *C. lapathi*. Varieties of *S. alba* and *S. daphnoides* 'Grisette' appeared to be immune.

SUGAR AND STARCH PLANTS

Proceedings of the 1955 meeting of British West Indies Sugar Technologists held at the Marine Hotel, Barbados under the auspices of the British West Indies Sugar Association, November/December, 1955.
Pp. 118.

1906 *Stevenson, G. C. Variety improvement in sugar cane. (pp. 13–22).*

In this survey of sugar cane breeding, the author discusses the varieties now in cultivation and the respects in which improvement is possible.

1907 *Stehlé, H. The principal agronomic aspects of the flowering of sugar cane: growth, methods of cultivation, maturity, deterioration, after arrowing, upper point of cutting. (pp. 49–58).*

The results are presented of investigations conducted by the Research Centre in the French Antilles. Long and short season Barbados varieties are compared with POJ2878 with respect to yield of cane and sugar, purity of juice and intensity and time of flowering. The effect of flowering on yield and subsequent growth was determined for a series of NCo. and Barbados varieties.

1908 *Stehlé, H. Intensity and seasons at which sugar cane flowers in relation to the sucrose and glucose content and the purity of juices. (pp. 58–62).*

The effect of flowering on brix, polarization, sucrose content and purity is recorded for NCo., Barbados and Puerto Rico seedlings tested in the French Antilles.

1909 *Stehlé, H. Effect of the flowering of sugar cane in its susceptibility to attack by moth borers of the genus* Diatraea. *(pp. 63–65).*

Data are provided on the susceptibility to *Diatraea* of arrowed and nonarrowed canes of the varieties NCo.330, POJ2878, CP44107, B34104 and BR905 grown under uniform conditions in Guadeloupe.

1910 *Chinloy, T. A survey of the intensity of small moth borer* (Diatraea saccharalis *F*) *infestation in the sugar cane of Jamaican sugar estates. (pp. 73–78).*

Clone POJ2878 and a series of Barbados varieties were studied; B3439 and B37172 were found to be the least affected by *D. saccharalis*.

1911 **(The production of superior sugar-cane varieties of the PT50 series).**
Kan-che Yen-chiu/J. Sugar Cane Res. 1954 : **8** : 151–60. [Chinese].

Data are provided on the botanical and agronomic characteristics, sugar production and disease resistance of seedlings resulting from hybridizations effected in 1950. Seedlings characterized by typhoon resistance, high sugar content and resistance to red rot and mosaic are listed. The five clones most promising in preliminary trials were PT50–2, PT50–62, PT50–497, PT50–498 and PT50–511.

1912 PRICE, S.
Cytological studies in *Saccharum* and allied genera. IV. Hybrids from *S. officinarum* ($2n = 80$) x *S. spontaneum* ($2n = 96$).
J. Hered. 1957 : **48** : 141–45.

Progeny from the above cross were found to be either $2n + n$, with 128 chromosomes or $n + n$, with 88 chromosomes. In the former group the maximum degree of pairing during meiosis was $63_{II} + 2_{I}$ and in the latter 44_{II}, with no evidence of synaptic association between the chromosomes of the two parents in either case. Autosyndesis in the hybrid indicates that the gametic chromosomes of *S. officinarum* 'Caña Blanca' consist of two groups of 20 and those of *S. spontaneum* 'Mandalay' of two groups of 24. It is suggested that the basic chromosome number in *S. officinarum* is 10 and that in *S. spontaneum* is 12 or, more probably, 8.

1913 Brett, P. G. C.
The identification of the more important sugarcane varieties grown in S. Africa.
S. Afr. Sug. J. 1957 : Suppl.; Bull. Exp. Sta. S. Afr. Sug. Assoc. No. 4 : unpaginated.

Full illustrated descriptions of the more important varieties of Natal and a key for their identifications are provided. The derivation of these varieties is portrayed in a diagram.

1914 Li, H. W., Chu, T. L. & Mok, B. C. [Mo, P.-C.]
New varieties released in Taiwan. F137, F138, F139, and F140.
Taiwan Sug. 1957 : **4** : No. 6 : 15–20.

F137(37–1645), from F108 x Co290, is recommended for sandy or moderately saline soils. F138 (PT48–655), from PT41–161 x Co356, ratoons well and is resistant to downy mildew and leaf scorch. F139 (38–2452), from 34–257 x POJ2878, is a large-barrelled, late variety suitable for irrigated soils. F140 (PT50–2), from PT43–52 x CP34–79, is a fast starter with hard canes but neither is typhoon-resistant nor ratoons well.

1915 **Four new "Q" canes.**
Aust. Sug. J. 1957 : **49** : 369–72.

The sugar cane varieties described here have been developed by the Bureau of Sugar Experiment Stations of Queensland. Q66, previously known as I233, was selected at the Meringa Experiment Station from the cross SJ4 x A285 (Korpi x Q30), one of the parents of Q30 being a strain of *Saccharum robustum*. It is distinguished by the presence of hairs on both sides of the leaf blade, as is SJ4. It lacks vigour on poor soil but does well on richer soils and shows excellent lodging resistance and good quality. It is susceptible to chlorotic streak and leaf scald. Q67 (Trojan x Q27) was produced at the Lower Burdekin Station and was previously known as L469. It is not suited to poor soils but has proved highly resistant to lodging on the rich, irrigated alluvial soils of the Burdekin region. Q68 (POJ2878 x Co290), previously known as H106, was developed at the Mackay Station and is characterized by vigorous first and second ratoon crops and high quality, similar to that of Q50. It is considered too vigorous for first class alluvial soils. It is resistant to gumming and downy mildew and tolerant to ratoon stunting but susceptible to chlorotic streak. Produced at Bundaberg, Q70 (POJ2878 x H31–2484), previously known as I70, is resistant to lodging, mosaic, leaf scald and downy mildew, moderately resistant to frost, susceptible to Fiji disease and sensitive to drought.

1916 Mukherjee, S. K.
Origin and distribution of *Saccharum*.
Bot. Gaz. 1957 : **119** : 55–61.

Morphological, phytogeographical and cytological studies of *Saccharum*, *Erianthus*, *Narenga* and *Sclerostachya* are discussed and it is suggested that the *Saccharum* complex originated in the India-Burma-China border area, that *Sclerostachya*, *Narenga* and *Saccharum* have a common origin from *Erianthus* and that further speciation in *Saccharum* resulted from polyploidy and hybridization.

1917 Stehlé, H.
Influence de la floraison de la canne sur la croissance, la végétation et le mode de culture aux Antilles françaises. **(The influence of the flowering of cane on growth, vegetation, and method of cultivation in the French Antilles).**
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 69–78.

Data are provided on the flowering season and other agronomic and industrial characters of some new varieties of sugar cane.

1918 **Annual Report of the Experiment Station of the South African Sugar Association for the year 1956-57 :**
Pp. 36.

NCo.334 (Co.421 x Co.312) and NCo.382 (POJ2725 x Co.301) have shown special adaptation to coastal sands. The results of trials with varieties of the N50 and N51 series are given; the highest yields came from N50–123 (NCo.310 x Co.331) and N51–538. Data are provided on the yield at three localities of 11 varieties of the third NCo. series. NCo.376 and NCo.382 gave the best results. Attempts are being made to induce apomixis by chemical means and by using pollen from distant relatives of sugar cane. It is hoped to rejuvenate varieties in this way. Four varieties have been inoculated with ratoon stunting disease and data are given on the cane yields per acre of these varieties with and without hot water treatment; the yield from Co.301 was significantly decreased by hot-water treatment.

The use of bunch planting as a selection technique is discussed.

1919 Hu, T.-H.
(Anatomical studies on the formation of roots on stems and leaves of the sugar cane induced by injection with 2,4-D).
Kan-che Yen-chiu/J. Sugar Cane Res. 1954 : **8** : 135–49. [Chinese].

Shoots of *Saccharum spontaneum*, *S. robustum*, cultivated canes and *Miscanthus japonicus* were injected with a 0·1% 2,4-D solution. In most of the cultivated canes but not in the other species, this treatment resulted in adventitious-root formation, the extent and type of root formation depending on the variety.

1920 Hebert, L. P.
Breeding behavior of certain agronomic characters in progenies of sugarcane crosses.
Diss. Abstr. 1957 : **17** : Publ. No. 17,444 : p. 468.

At the US Sugarcane Field Station, Houma, La., seven crosses were investigated with respect to stalk diameter, stalk erectness, number of stalks per stool and Brix value and sucrose (pol) content of the juice of the first stubble and of both the plant cane and first stubble of the clones derived from these single stools. Correlation coefficients obtained between single stools and clones indicated that selection for stalk diameter and Brix percentage would be fairly effective at the single-stool stage, provided it was not too rigid, but that selection for erectness and number of stalks per stool at this stage would be less valuable. Brix value and sucrose (pol) content were highly and positively correlated and constitute reliable criteria of selection of clones in any one season. Except for this correlation, the four characters studied were independent. Close association was found between parents and progenies for each character.

1921 Singh, H. N.
Breeding behavior of fiber in sugarcane.
Diss. Abstr. 1957 : **17** : Publ. No. 17,449 : p. 474.

Significant positive correlations were detected between percentages of fibre and bagasse in all of the seven crosses investigated at Louisiana State University. No relationship was found between fibre percentage and stalk erectness. Low but significant positive correlations between fibre percentage and number of stalks per stool were obtained in some crosses. Fibre percentage was significantly and positively associated with sucrose content. Fibre percentage is quantitatively inherited and unaffected by dominance. The frequency of recovery of parental types with respect to fibre content was high. Fibre content also underwent transgressive segregation. A close relationship was found between the fibre contents of parents and progenies. It was concluded that a variety high in fibre content may be used in breeding, provided that it is combined with a parent low in fibre percentage.

1922 **Report on the Sugar Experiment Stations for the year 1956.**
Sug. Bull., Georgetown 1957 : No. 25 : 93–98.

The varieties introduced during the year for testing are listed and a table showing the numbers of the different types of varieties under test and multiplication is included.

1923 Birkett, L. S., Cameron, C. & Paul, H.
Fertilizer experiments.
Sug. Bull., Georgetown 1957 : No. 25 : 54–79.

Some varietal differences have been observed in the variation of pol % cane at different levels of application of nitrogenous fertilizers.

1924 Stehlé, H. & Blanche, D.
Une nouvelle maladie bactérienne de la canne à sucre à la Martinique: le "leaf scald" à *Xanthomonas albilineans* (Ashby) Dowson. [**A new bacterial disease of sugar cane in Martinique: leaf scald due to *X. albilineans* (Ashby) Dowson.**]
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 59–64.

The principal varieties of sugar cane cultivated in Martinique are classified according to their resistance to *X. albilineans*; this preliminary classification agrees with the results of tests carried out in British Guiana. The varieties B33.37, B40.98 and B47.151 are considered to be very resistant.

1925 **(Report on comparative trials of sugar-cane varieties in 1953-54).**
Kan-che Yen-chiu/J. Sugar Cane Res. 1954 : **8** : 161–233. [Chinese].

Extensive data are provided on the agronomic performance, sugar production and disease resistance of seedlings obtained from hybridizations effected during 1947–50. Fourteen varieties regarded as especially promising are briefly described.

1926 Méndez-Roig, F. & Samuels, G.
Sugarcane variety trials in Puerto Rico, 1951-55.
J. Agric. Univ. PR 1957 : **41** : 147–60.

The results of yield trials held in various districts in Puerto Rico are reported.

1927 Hayot, H.
Activité du Centre technique de la canne et du sucre de la Martinique au cours des quatre premières années de son existence. **(The activity of the Technical Centre for Cane and Sugar in Martinique during the first four years of its existence).**
Rev. agric. sucr. rhum. Antilles franç. 1957 : **2** : 79–82.

A brief account is given of the varietal trials carried out in Martinique. Of the new varieties tested, B46.364, B50.377, H328.560 and B50.135 have shown most promise.

1928 **Field experiments with sugar cane, XXV.**
Sug. Bull., Georgetown 1957 : No. 25 : 1–45.

Detailed results are presented of variety trials at a number of localities in British Guiana in 1956. The superiority of B41227 has again been shown but B47258 and B49119 have also given good results and B45137, B43413 and D37/45 are promising.

Vsesojuznyj Naučno-issledovatel'skij Institut Saharnoj Svekly (VNIS), Bjulletenj Naučno-tehničeskoj Informacii. **(All Union Research Institute for Sugar Beet, Bulletin of Scientific-Technological Information).**
Kiev 1956 : No. 2 : Pp. 98. [Russian].

The following items contain information on plant breeding:—

1929 *Popov, A. V. (Monogerm sugar beet). (pp. 3–6).*

Root yields of 223–303 c. per ha. have been obtained from the new monogerm varieties and their sugar content is not inferior to that of the common varieties. Their extensive adoption in agriculture is recommended.

1930 *Negovskij, N. A. (Results of phasic analysis of the new varieties of sugar beet). (pp. 7–10).*

The figures given show great variations in the degree of bolting after vernalization in sugar-beet varieties recently bred in the Soviet Union, those with the least bolting being M2, L044, U035, N037, MN1439 and VI515.

1931 *Fedorov, A. I. (Results of regional tests of the station élites of beet in 1954–55). (pp. 11–14).*

The yield of roots varied from 186 c. to 624 c. per ha. in 1955 and the sugar content varied from 14·9% to 21·1%. Information is given on the varieties released from the different stations; they include monogerm varieties equal or almost equal to the standard varieties in sugar yield. Certain varieties are indicated as being suitable for a wide range of environmental conditions.

1932 *Sevost'janov, S. P. & Eleckaja, L. E. (A sugar-beet variety resistant to* Cercospora, *Pervomajsk Hybrid). (pp. 73–83).*

The lines resistant to *Cercospora*, which hitherto have been lacking in vigour of development in the first part of the growing period, have been crossed with vigorous varieties of the E and N types. One of the most successful hybrids, here described, has given root yields 3–6% above those of the standard variety Ramon' 632E, sugar percentages 2·8–3·4% higher and total sugar yields 5·6–9·7% higher.

1933 *Kul'čickaja, Z. A. (New varieties of spring wheat from the Ramon' station). (pp. 91–94).*

Several promising varieties have originated from the cross Caesium III x (Lutescens 62 x *Agropyron glaucum*) x Caesium III, all of them having a higher productive tillering capacity and higher yield than Lutescens 62. The best of these hybrids, Erythrospermum 15/48, gave an average grain yield of 22·5 c. per ha. in 1953–55, which is 5·6 c. higher than the standard variety; the grain has a crude gluten content of 35–40% and produces flour of excellent quality; the variety is more resistant to smut and brown rust than Lutescens 62.

Vsesojuznyj Naučno-issledovatel'skij Institut Saharnoj Svekly (VNIS), Bjulletenj Naučno-tehničeskoj Informacii. **(All-Union Research Institute for Sugar Beet, Bulletin of Scientific-Technological Information).**
Kiev 1956 : No. 3 : Pp. 130. [Russian].

1934 *Sukačev, V. P. (Brief summary of the results of sugar-beet breeding at the Veselyj Podol Plant Breeding Station in 1952–54). (pp. 46–51).*

The best hybrids gave root yields 1·2–3% above those of the standard variety P632 in 1954, the sugar yield being 8·2–11·0% higher. Crossing two roots of different types after one had been grafted on to the other, intravarietal hybridization between plants of the same variety reproduced under different ecological conditions, and summer planting of mother plants also led to increases in yield. Certain hybrids are mentioned as showing less reduction in sugar content than others when grown under unfavourable conditions or in square plantings.

1935 *Fedorov, A. I.* (*Importance of seed and root mixtures in constituting sugar-beet varieties*). (*pp. 52–56*).

In constituting a strain, better yields of roots and of sugar were obtained when seed of several lines of similar origin were employed. The less favourable effect of mixing seed of different origin is explained by the unequal development of such mixtures so that the slower-growing forms with high sugar content tend to be removed in the thinning operations. When root mixtures were compared the best sugar yields came from mixtures of different origin.

1936 *Zajkovskaja, N. E.* (*Influence of amount of pollen on the progeny*). (*pp. 69–76*).

Emasculated flowers were pollinated with unlimited quantities of pollen and with reduced quantities by pollinating 15–20 flowers with a single stamen; controls were subjected to open pollination. Many of the flowers with limited pollen retained their receptive capacity for 6–8 days whereas those with unlimited pollen dried up after 2 days; the proportion of ovules that developed normally was 28·0% in the limited pollination and 95·4% in the unlimited and the rate of development was also reduced. Compared with the open-pollinated progeny that from limited pollination yielded 2·1% less and that from unlimited 6·9% more sugar.

Flowers that had been pollinated with pollen from the same variety of sugar beet followed by application of garden-beet pollen 8 hours later gave rise to progenies with 28·8–34·0% of hybrid plants; when the second pollination was delayed the proportion of hybrid plants diminished, being 2·0% with an interval of 72 hr. Flowers that had been emasculated, left for 48 hr. for open pollination and then bagged gave a seed set of 83·0% as compared with 90·8 in plants left indefinitely without bagging; those bagged after 8 hr. gave a set of 53·8%. Supplementary pollination, performed by shaking the plants three times a week during the flowering period, produced heavier seeds, which gave rise to a progeny with a 7·2% greater yield of sugar than that from untreated plants.

1937 *Maljuta, D. I.* (*Hybrids between branched winter wheat and branched rye*). (*pp. 98–101*).

Crosses of a branched winter-wheat hybrid with a branched winter rye gave rise to an F_1 consisting of some branched and some unbranched individuals; the ears of the branched hybrids produced up to 500 spikelets, which were all sterile; pollination with branched winter wheat produced a few grains. The chromosome number in the pollen mother cells is given as 2–27 and irregularities occur in tetrad formation and in the size of the pollen grains.

1938 *Zelenskij, S. S.* (*The new oat variety L'gov* 1026). (*pp. 114–17*).

The variety described was raised by selection from a cross of Pobeda [Victory] x 255 (*Avena byzantina* x Gigant [Giant]) and has exceeded the standard varieties for the Ukraine, Victory and Sovetskij, by 3–6 c. per ha. It is resistant to crown rust and smut and its grain, which is good in quality, has a slightly lower husk percentage than that of Victory. The variety has done well in a number of different provinces of the Soviet Union.

Vsesojuznyj Naučno-issledovatel'skij Institut Saharnoj Svekly (VNIS), Bjulletenj Naučno-tehničeskoj Informacii. (**All-Union Research Institute for Sugar Beet, Bulletin of Scientific-Technological Information**).
Kiev 1957 : Nos. 4–5 : Pp. 172.

1939 *Orlovskij, N. I.* (*Breeding sugar beet in the USSR in its present stage*). (*pp. 9–18*).

In a review of achievements in the last 40 years some special characteristics of Soviet breeding methods are mentioned. One is the attention to the biological reactions of the breeding material in respect to the particular ecological conditions of the areas for which it is designed. Another is the use of hybridization, both for enlarging the range of adaptation of a variety and for utilizing the effect of heterosis. A further feature is the system of testing breeding material in the widest range of climatic and agronomic conditions. The result has been a series of varieties combining high root yield with high sugar content in a number of areas of the Soviet Union and others distinguished by resistance to *Cercospora*, freedom from bolting or good response to irrigation. Some 3 million extra centners of sugar have been added to the annual yield by means of these improvements in the varieties; two monogerm varieties are being multiplied on a scale sufficient to plant several hundred thousand hectares in the next 2–3 years. In yield the best monogerm selections now approach the best standard varieties and in sugar content they are equal. The monogerm character, which is recessive, is being combined with resistance to *Cercospora* and storage rot, both dominant characters.

1940 *Fedorov, A. I.* (*Means of improving seed production of sugar beet*). (*pp. 111–14*).

In examining the methods and some of the defects of the seed-production system in the

Soviet Union it is mentioned that by 1960 some 300,000 ha. will be planted with monogerm beets. The new varieties R023, V031 and V038 are mentioned as those with the best combination of yield and sugar content.

The component lines from which a variety is constituted are grown separately, seed of them is mixed for growing the mother plants and the seed produced from these is grown on the farms; seed is now changed every year and this has led to a considerable improvement in the quality of the crops.

1941 *Sevost'janov, S. P., Eleckaja, L. E. & Rakitjanskij, V. K.* (*The quality of the root of the* Cercospora-*resistant varieties P028 and Pervomajsk Hybrid*). (*pp. 153–56*).

The two varieties in question have proved superior to R06, the standard sugar-beet variety for the Krasnodar area, in resistance to *Cercospora*, sugar content and yield of sugar per centner of roots and per hectare; they do not lose their leaves when ripe and are thus more suitable for mechanical harvesting and more useful for fodder production.

1942 MAZLUMOV, A. L.
(Breeding and seed production of sugar beet in the USSR in the past 40 years).
Agrobiologija (Agrobiology) 1957 : No. 4 : 3–13. [Russian].

This account of breeding work mentions new varieties from Ramon' and Verhnjačka which have a sugar content of 20% and a root yield of the order of 500 c. per ha. Other newly-bred forms include a *Cercospora*-resistant variety with a high sugar content from Pervomajsk and a monogerm beet from Belaja Cerkov'. The latter yields 15 c. more roots and 1·8 c. more sugar per ha. than the multigerm standard for the province of Kiev. In discussing the aims and methods in breeding research, the recent trend in the use of colchicine-induced polyploidy is mentioned; it is thought that the resulting triploids will yield 50–60 c. more roots per ha. than the initial diploid variety and have a 0·5% higher sugar content.

1943 Centraal Bureau G.A. met veredeling van suikerbieten begonnen. **(Sugar beet breeding begun at the Central Bureau & Co.).**
Zaadbelangen 1957 : **11** : p. 389.

The official opening at Hoofddorp, Netherlands, of the sugar beet laboratory of the Agricultural Crop Breeding Department of the Central Bureau took place on 6 November, 1957.

1944 SAVITSKY, H. & GASKILL, J. O.
A cytological study of F_1 hybrids between Swiss chard and *Beta webbiana*.
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 433–49.

F_1 hybrids of *B. vulgaris* var. *cicla* ($2n = 18$) x *B. webbiana* ($2n = 18$) contained 18 unpaired univalents at diakinesis in some pollen mother cells while in others 1–5 bivalents were observed. The shape of the bivalents was typical for *Beta*. The chiasma frequency was estimated as 3·04 per PMC, suggesting that pairing was allosyndetic. The distribution of the chromosomes at anaphase I was highly irregular. The number of chromosomes at this stage varied from 18–36, according to the number of univalents which divided. Only one cell had $2n = 36$. A noteworthy deviation was the formation of multipolar spindles at anaphase I. Such spindles however functioned more efficiently than bipolar ones. The second meiotic division did not take place, dyads, triads, tetrads and so on being formed, according to the number of poles at anaphase I. As a consequence of spindle multipolarity a large number of nonviable pollen grains with fewer than 9 chromosomes were produced. The percentages of various categories of pollen grains in the anthers of open flowers were: empty, 21·8; with undivided nucleus, 74·7; with generative and tube nuclei, 3·0; and with two male nuclei and a tube nucleus, 0·5. It is pointed out that grains with $n = 9$ or $n = 18$ may not necessarily be viable since this will depend upon a favourable combination of chromosomes from the two parents. Possible ways in which the F_1 hybrids may be utilized at the tetraploid level in breeding are suggested.

1945 POWERS, L.
Identification of genetically-superior individuals and the prediction of genetic gains in sugar beet breeding programs.
J. Amer. Soc. Sug. Beet. Tech. 1957 : **9** : 408–32.

An application of the method of partitioning variance to sugar-beet breeding is described. Six varieties were grown, two, genetically homogeneous, for measuring environmental variation, and four genetically heterogeneous. The formula $Z = \bar{x} + s_d x'$, where Z is the upper class limit for environmental variation alone, $\bar{x}$ is the obtained mean, s_d is the standard error of the environmental variance and x' is the appropriate value in Pearson's normal probability tables, is used to identify genetically superior individuals and to predict genetic gain. The characters studied were root yield and sugar percentage. In the case of variety Gw359–52R, these two characters had a high negative genetic covariance. Suitable methods of selecting for these two characters in combination are discussed.

1946 Simulescu-Saru, N. & Drăghici, D.
Soiurile noi de sfecla de zahăr: Lovrin 532 şi Cîmpia Turzii 34. (**The new sugar-beet varieties Lovrin 532 and Cîmpia Turzii 34**).
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 281–304.

The above two varieties have been obtained by intravarietal crossing and selection within the varieties Buszczynski MLR and Buszczynski CLR, respectively. The first variety is characterized by early sugar accumulation; the latter is a later variety responding well to fertilizers.

1947 Knapp, E. & Wiebalck, H.
Über den Anteil der Diploiden, Triploiden und Tetraploiden an den Leistungseigenschaften einer polyploiden Zuckerrübensorte (Kleinwanzlebener Polybeta). [**On the part played by the diploids, triploids and tetraploids in the yield characters of a polyploid sugar beet variety (Kleinwanzlebener Polybeta)**].
Z. Zuckerind. 1957 : **82** : 166–69.

In comparisons of the diploid, triploid and tetraploid components of Kleinwanzleben Polybeta, carried out in Germany, the triploids always yielded most roots and sugar per ha. under normal fertilizer treatment but were exceeded in root yield by the diploids at 200 kg./ha. N. The tetraploids were lowest in yield.

1948 Graf, A.
Die Bedeutung der polyploiden Zuckerrüben in Oesterreich. (**The importance of polyploid sugar beets in Austria**).
Z. Zuckerind. 1956 : **80** : 477–80.

Comparisons of data from Denmark, Germany and Austria show that the superiority in growth and yield of polyploid sugar beets over diploids is greatest in the last-mentioned country.

1949 Kloen, D. & Speckmann, G. J.
The creation of tetraploid beets. V.
Euphytica, Wageningen 1957 : **6** : 193–97.

The C_2 generation of sugar and fodder beets developed at the Foundation for Agricultural Plant Breeding, Wageningen, Netherlands, was subjected to further cytological examination for tetraploidy, prior to flowering in a field trial [cf. XXV, 434 and XXVII, 3277]. The mean percentage of C_2 tetraploids was 90% as against 86% in the C_1. The remainder of the C_2 material consisted mainly of aneuploids and triploids, only one diploid being discovered.

1950 Thompson, E. G.
Bolting in early sown sugar beet. Comparison of strains, 1957.
Brit. Sug. Beet Rev. 1957 : **26** : 61–62.

The number of total bolters and early bolters is given for thirteen recommended varieties. The two Bush strains E and N have given the most consistent low bolting results for the past three years; Sharp's Klein E gave similar results to these in 1957.

1951 Gemma, T.
(**On the capacity for fertilization of the sugar-beet gynecium and the mechanism of self incompatibility**).
Yamagata Daigaku Kiyo (Nogaku)/Bull. Yamagata Univ. (Agric. Sci.) 1956 : **2** : 209–13. [Japanese].

Self pollen germinates well on the stigma but subsequent growth of the pollen tube is disturbed. Bud pollination is ineffective after both self and cross pollination.

Pollen grew poorly on agar to which self stigmatic tissues had been added but well on agar with stigmatic tissues from other plants or with no additional plant material.

1952 Hogaboam, G. J.
Factors influencing phenotypic expression of cytoplasmic male sterility in the sugar beet (*Beta vulgaris* L.).
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 457–65.

When present in the homozygous condition, *X* is capable of restoring pollen fertility in plants carrying male-sterile cytoplasm (S), *xx* plants all bearing white empty anthers. The S *Xx* genotype is however variable in its phenotypic expression, ranging from the class in which most of the anthers of a single plant are yellow to the class in which all the anthers are completely white. A dominant gene designated *Sh* has been detected which, without itself being a pollen restorer, enhances the pollen-producing ability of S *Xx* so that a range of phenotypes involving various combinations of white and yellow anthers but no unmixed white anthers results. Evidence was obtained that the factor pair *Xx* is linked with M^1m for seed number per cluster. A pleiotropic action of the monogerm genotype *mm* in raising the number of white-anthered phenotypes is not however precluded.

1953 OLDEMEYER, R. K.
Sugar beet male sterility.
J. Amer. Soc. Sug. Beet. Tech. 1957 : **9** : 381–86.

In experiments at the Agricultural Experiment Station, Great Western Sugar Co., Longmont, Colo., an analysis of the progeny produced by different cytoplasmically male-sterile parents when crossed with the same pollinator provided evidence of the effect of interaction of genes from the two parents upon the expression of sterility, this interaction differing according to the combination. The consistent disparities found in the proportion of sterile progeny derived from cytoplasmically male-sterile parents when crossed with a set of common pollinators are ascribed either to differences in minor genes not involved in gene-cytoplasmic interactions or to cytoplasmic variations. Microscopic examination showed that heterozygous plants having male-sterile cytoplasm varied as to pollen abortion in a continuous series from abortion in the tetrad stage to normal pollen production. The author coordinates the microscopic classification of the pollen with the visual classification used. According to preliminary data, two new sources of male-sterile cytoplasm, one in *Beta macrocarpa* and the other in a wild beet from Turkey (PEI206411), are very similar to those already available.

1954 ALDROVANDI, A.
La barbabietola da zucchero monogerme. (**Monogerm sugar beet**).
Sementi elette 1957 : **3** : No. **6** : 22–27.

An outline is given of the system employed by Savitsky and others in the USA and the advantages of monogerm beets in Italy, particularly for autumn sowing in the south, are pointed out.

1955 ORLOVSKIJ, N. I.
(**At the USSR Sugar Beet Scientific Research Institute**).
Agrobiologija (Agrobiology) 1957 : No. **3** : p. 157. [Russian].

Mention is made of monogerm forms of sugar beet, bred at Kiev, the Jaltuškovsk Breeding Centre and Belaja Cerkov', which have approximately the same root yield and sugar content as the multigerm standards. Belocerkovskaja Odnosemjannaja [Monogerm Belaja Cerkov'] has already been made a standard in some districts of the province of Kiev.

1956 VUKOV, K.
A cukorrépa rosttartalma. (**The marc content of sugar beet**).
Növénytermelés 1956 : **5** : 355–66.

A method of determining marc content from the difference between the total dry matter content and the soluble dry matter content as established by refractometer readings has been developed at the Sopronhorpács Research Institute for Plant Improvement, Hungary, the average values obtained showing good agreement with those obtained by Claassen's method. Significant intervarietal differences in marc content were found, but the character does not appear to be related to sugar content or to be otherwise of value in breeding.

(**Breeding sugar beet for increased sugar content**).
Moskva, Sel'hozgiz 1957 : Pp. 278. [Russian].

The proceedings of a meeting of the section of technological crops of the Lenin Academy of Agricultural Sciences, held on 23–25 Nov. 1954, contain the following items of interest to plant breeders.

1957 *Jakuškin, I. V.* (*Problems of breeding sugar beet for increased sugar content*). (*pp. 3–7*).

The importance of the conditions under which the mother plants are grown is emphasized, while recognizing that hereditary differences of up to 1·5% may exist between different varieties.

1958 *Orlovskij, N. I.* (*Breeding for increased sugar content in sugar beet*). (*pp. 8–31*).

Figures are given showing the average yield of roots, sugar content and yield of sugar per ha. for the newly introduced sugar-beet varieties in different parts of the Soviet Union, compared with the older varieties. At present the sugar yield from the tonnage types is 15–20% higher than that from high-sugar types, but some of the newer varieties of the N type, such as V020 and R931, are about equal to the tonnage types in sugar yield. Certain anatomical and other features which distinguish the sugar types from the normal and tonnage types are mentioned; one of these features is a tendency to reach the maximum intensity of assimilation late in the season; the combination of maximum yield and maximum sugar content has not yet been achieved but improvements in this direction have been attained by using F_1 seed of intervarietal crosses, with and without previous vegetative hybridization. Selection of the mother plants with the largest leaf surface at the end of the growing season has also led to an increase in sugar production. Other measures which have had the same result are excision of buds from the lower tissues of the root neck, summer planting and pinching the flowering buds.

The variety V020 referred to above was produced at the Verhnjačka station by selection of two mother plants with the best combination of yield, sugar content and other characters, testing their progeny under a variety of conditions in two successive years and then combining the seed. The original populations from which the selections were made were obtained by crossing E with Z types. At the Ramon' station plants that retain their leaves till the end of the growing season and those which maintain a high sugar content when grown in square plantings are given preference in making selections. Determinations of quality based on ash content and noxious nitrogen are not considered reliable.

In pointing out a number of defects in the sugar-beet breeding in the USSR the opinion is expressed that insufficient attention is given at some stations to the growing of breeding material in a range of different ecological conditions, to the use of breeding lines with high sugar content so as to improve this quality as well as yielding ability and to the cytological and general physiological study of the breeding material. Sugar content often suffers as the result of errors in the system of seed production, some of which are mentioned. A breeding programme which would obviate the deficiencies referred to above is outlined.

1959 *Mazlumov, A. L.* (*Increasing sugar content and quality of sugar beet*). (*pp. 32–50*).

The best breeding lines at the Ramon' breeding station exceed the standard R632 by 5–11% in root yield, 4–5% in sugar content and 10–15% in yield of sugar. The lines are sown together without spatial isolation, the best plants being multiplied clonally and allowed to interpollinate. Line 502, which arose from a mother plant selected in 1952, has retained its high sugar content for over 12 years under such conditions, having exceeded the standard in certain years by as much as 1·0 in sugar percentage. Good results have been obtained by summer planting and progenies of plants selected under these conditions have never been inferior to the initial material; some of them have exceeded it by up to 2·6 c. in yield of sugar per ha., selection having been based on size of seed ball and development of young roots.

Vegetative hybrids 45 and 47 have respectively 13·5% and 8·1% more sugar per ha. than R632; both were obtained by grafting a high-sugar variety 4742 on to an E type.

A comparison of the breeding lines when planted at wide spacings, 44·5 x 36 cm., showed that some gave higher yields of sugar per ha. than at the normal spacing; such lines are selected as being suitable for square planting and the variety R023 has been produced in this way; it has surpassed all others in yield of sugar per ha.; R931, produced by crossing four promising pedigree lines, is also a good sugar producer, though not quite so good as R023.

The former system of seed production, involving 2–4 reproductions without further selection, is being replaced by a system in which commercial seed is produced every year from selected élites.

Selections of the high-sugar type gave the highest yield of sugar at close spacings of 45 x 10 cm., whereas the tonnage types gave their best yields at 45 x 20 cm.; it is important therefore to use suitable spacings when carrying out selection operations.

Hybrid seed from crossing the tonnage variety R632 with the high-sugar variety Janasz gave rise to plants with a much higher sugar content than that of R632; the yield of sugar per ha. was 59·7 c. as against 59·3 c. in 1952 and 49·9 c. as against 49·6 c. in 1954.

The yield of sugar in the factory may vary by as much as 7% in lines of equal sugar content, according to their quality; the method of determining this from the purified normal juice and the molasses coefficient is recommended.

1960 *Okanenko, A. S.* (*Using physiological and biochemical characteristics of different forms of beet for increasing the sugar content of sugar beet*). (*pp. 51–81*).

Data presented show that in the early phases of growth the sugar content of the leaves is higher in sugar beets than in mangels and garden beets; in grafted individuals the sugar content of the leaves of the scion generally corresponded to that characteristic of the type used as rootstock. Studies were made of the distribution of sugar in the root; in mangels the greatest concentration was found in the vascular bundles whereas in sugar beets this was true only in the first three rings and in the other portions of the root the concentration was greater in the parenchyma, as it was throughout in the roots of leaf beets.

Grafts of different beet forms on the same rootstock showed that the sugar content of the leaves was greatest in the sugar beet, closely followed by the mangel, and least in the table beet. Analyses of the roots of the high-sugar variety Kal'nik showed their cells to be smaller than those of Uladovka, a tonnage variety, and their content of dry matter, sugars and protein nitrogen to be higher; the ZZ variety Janasz accumulated more sugar during the day than the EE variety Har'kovskij; the amounts were roughly equal at the end of the night in the early part of the growing season; however by mid-October the nocturnal flow of sugar from the leaves had almost ceased in Har'kovskij but was still active in Janasz; the production of sugar per unit of green weight was higher in the variety Janasz. Hybrids between different types might resemble one type in one tissue and the other in another. The hybrids varied also according to conditions, those of sugar beet x mangel resembling sugar beet when grown under conditions of high fertility whereas in ordinary conditions they were intermediate. When mangels or garden beets were crossed with sugar beets the F_1 was intermediate in sugar content whereas in crosses with leaf beets the sugar content was increased, as were the contents of dry matter and protein and the catalse activity, while the ash content was reduced. Some of the hybrids of sugar beet with mangel and garden beet had reduced contents of ash and soluble nitrogen and are regarded as valuable in breeding for quality. Although no clear correlation between sugar content and anatomical features could be established, some of the hybrids seemed to be promising in having a reduced proportion of parenchyma to vascular tissue. A plant obtained by crossing sugar beet with a hybrid of leaf beet x a semisugar beet was distinguished by higher sugar content in the parenchyma than in the vascular bundles.

Seed progeny of leaf beet grafted on to the sugar beet M6(ZZ) showed resemblances to sugar beet and produced roots in which the sugar content was equal to that of M6; the respiration rate of the leaves, which is lower in leaf beets, was raised in the grafted forms and also in their seed progeny; their sugar content was higher in the early growth phases and lower in the later phases. The respiration rate of the roots was double in the leaf beet and in the progeny was roughly equal to that of sugar beet; the roots of leaf beets also had a high diastatic activity and assimilation rate. Some interesting combinations of these various properties were found among hybrids of leaf beet with mangels and several of them are considered to be of value for breeding purposes.

Segregation occurred in crosses of mangel with *Beta corolliflora*, both with and without grafting. Some of the hybrids had very enlarged roots and small leaf development.

1961 *Kursanov, A. L.* (*New developments in the theory of sugar formation*). (*pp. 82–89*).

Reference is made to experiments with $C^{14}O_2$ which indicate that sucrose is the first sugar formed in photosynthesis, that it is conducted rapidly away from the leaves into the petioles and thence to the roots and that the roots themselves are not capable of synthesizing sucrose from glucose and fructose. For these reasons it is suggested that more attention should be directed to the leaf in sugar-beet breeding.

1962 *Sevost'janov, S. P. & Eleckaja, L. E.* (*Breeding sugar beet for increased resistance to* Cercospora *and higher sugar content*). (*pp. 112–22*).

Breeding lines selected for resistance to *Cercospora* in the Kuban' area have excelled the local standard R632E by 13–15 c. per ha. in yield of sugar. The variety Pervomajsk 028 exceeded R632E by as much as 42% in sugar yield under conditions of high *Cercospora* infection, the respective yields being 87·8 c. against 61·9 c. of sugar per ha. in 1952 and 83·3 c. against 69·1 c. in 1953; the resistant variety retains its leaves in a healthy green state until the end of the growing season and thus produces a valuable yield of fodder too. Its main defect is a rather slower root development in the early stages of growth, to remedy which it has been pollinated by high-yielding varieties from other areas; the hybrids were no less resistant and their yield of sugar was raised by up to 9%; the reciprocal hybrids were slightly less resistant in the later parts of the season but exceeded the susceptible parent in sugar yield.

1963 *Zajkovskaja, H. Ė.* (*Questions of pollination and fertilization in sugar beet*). (*pp. 123–32*).

Plants of the variety R632 pollinated with self pollen and pollen of red beet at the same time gave rise to 50·9% of red beets; when the red-beet pollen was applied 8 hr. later the percentage was 28·8, after 24 hr. it was 13·3 and after 48 hr., 6·4. The sugar content was reduced even in the white progeny. Changes both in morphology and sugar content were observed in the progenies of sugar beet, mangel and leaf beets subjected to open pollination and in some plants in the progenies the characters of more than one pollinator were observed.

Pollen of the variety M6 germinated more rapidly in artificial media than that of VI691 and flowers pollinated with M6 developed more quickly. When these two varieties were used to pollinate mangels and table beet, rather more progeny of the sugar-beet type arose from pollinations of M6, a high-sugar type, than from VI691, a tonnage type; when mangel, table beet and leaf beet were grown together with these two sugar-beet varieties and allowed to open pollinate, the progeny of the sugar beets contained 31·3–34·9% of plants of the maternal type; progenies of mangel contained 16·8% and those of table beet 6·5% of plants of the maternal type and those of leaf beet none at all. Pollinations with mixed pollen also showed pollen of the high-sugar varieties to be the more effective; thus addition of 1/4 of the pollen of variety VI04 to pollen of R632 had the same effect as pure pollen of VI04 in raising the sugar content of R632 yet 1/4 pollen of R632 mixed with that of VI04 had little or no effect in reducing the sugar content of progenies from VI04.

1964 *Grin'ko, T. F.* (*New varieties of sugar beet and methods of breeding them*). (*pp. 133–45*).

The Verhnjačka breeding station has in the past increased the sugar content of its varieties somewhat at the expense of yielding ability but the recent variety V020 outyields all but M2 and with a sugar content of 20·3% has given yields of 59·3 c. of sugar per ha., which is 0·7% more than that from M2 and 10% more than the ultrasugar variety VI04. The variety, which has been approved for cultivation in a number of areas, was produced by repeated individual plant selection from hybrids of V23 x R1537, the selections being tested under a range of ecological conditions. Two later varieties have been produced by the same method: V024, from repeated selection in a cross of V23 with the tonnage varieties I1305 and R1537, some of the selections being carried out in Kirgizia, equals V020 in sugar content and exceeds it in root yield; V031 equals V020 in root yield and exceeds it in sugar content, which was 18·1 as against 17·7 in 1954. Further repeated selection from the material that gave rise to V020 has led to the production of 10 superior lines, three of which have been combined to produce the variety V038, which exceeds V020 in both yield and sugar content.

Comparison of selections from a wide range of initial material showed the most successful to be those from V2291/45, which is a line from the same cross that gave rise to V020, V024 and V038. The secret of this success is thought to be in crossing varieties differing in place of origin and selection under a wide range of conditions.

1965 *Zosimovič, V. P.* (*Importance of the characteristics of the biological groups of varietal populations for improving sugar beet in the main beet-growing zone of the USSR*). (*pp. 147–62*).

A correlation has been established between the length of life of the leaves and the number of rings of vascular tissue and sugar content; the highest sugar content is associated with a large number of leaves of medium size. Seed from July planting has given rise to plants with a better combination of root yield, sugar content and yield of sugar than that from spring planting in those parts of the Soviet Union subjected to summer drought.

The sugar beets grown in the Soviet Union contain plants of five groups, varying in rhythm of development. The proportion of the different groups in populations of sugar beet in different areas varies according to the ecological conditions of the area. The most valuable for breeding purposes are groups II and III, the former being high-yielding, early-ripening forms of the tonnage type, characterized by high vitality and good leaf development in all phases of growth and satisfactory sugar content; group III comprises medium-ripening forms with satisfactory leaf development in summer and the later phases of growth, and is characterized by high root yield and high sugar content. Hybrids between these two groups have given 68·1 c. of sugar per ha. under conditions where group III gave 61·9 c. Group IV is relatively late in ripening and reaches its maximum leaf development in the second half of the growing season; for this reason it is often discarded during selection and seed production operations, in spite of its having a high sugar content in the roots. Hybrids of this group and the late group V with the early groups I or II showed heterosis in respect of root yield, sugar content and yield of sugar. Since in most parts of the Soviet Union the relatively early forms give the highest yield of seed and are the most vigorous, they tend to be selected at the expense of the later forms with higher sugar content; selective fertilization acts in the same direction. Breeders and seed producers are urged to correct this tendency.

1966 *Negovskij, N. A.* (*Hybridization and breeding high-yielding varieties of sugar beet*). (*pp. 163–80*).

Two varieties, B541, an E type, and P771, an N type, were grown in four different localities and allowed to interpollinate. When grown in 1951 at Pervomajsk, seed from the cross P771 x B541 gave a greater sugar yield than that from the reciprocal cross, the differences varying from 0·5 c. to 4·8 c. per ha. At some of the other places greater sugar yields were obtained from the reciprocal crosses, differences of up to 3·2 c. per ha. being recorded.

A greater number of varietal combinations were tested in 1952 and succeeding years. In crosses of E x E types only one case of increased yield was observed and in all such crosses there was a reduction in sugar content. In crosses of E types with Z and N types most hybrids had a higher sugar content than the E parent, though some had a lower yield of roots or of sugar; the hybrids of E types with Janasz (ZZ) showed an increase in root yield, sugar content and yield of sugar. Reciprocal crosses, where the E types served as pollinator, exceeded the maternal parent in root yield and by up to 4 c. per ha. in yield of sugar.

Many of these hybrids when grown in moist conditions exceeded the standard R632 in sugar yield by up to 8·8%; in more arid conditions, however, they were often inferior.

The sugar-beet varieties VI691 (E) and M6 (ZZ) when grown in propinquity to mangel, garden beet and leaf beet gave rise to a number of hybrids, 17·9% and 15·1% of which respectively showed the characters of more than one pollinating parent. Many complex hybrids formed from two E varieties, of different provenance, and one Z or N variety exceeded single hybrids of E x Z by up to 6·7 c. of sugar per ha.; others on the other hand showed no such improvement, and the behaviour varied in the different localities in which the hybrids were tested. Figures are also given showing that the behaviour of the hybrids differed according to the percentage of the respective components in the mother-plant population producing the seed.

The first and second seed generations of the tonnage variety VI591 grafted on to varieties V1612 and M6, both having higher sugar contents, showed increases in sugar content of 0·5–0·6%; when V1612 served as rootstock the root yield was unchanged and the sugar yield was increased by up to 6·9 c. per ha. whereas with M6 as rootstock the root weight and sugar yield were both reduced. From hybrids obtained by grafting the E type I1305 on to V1612 an increase of sugar yield of up to 16% was obtained.

A list is given of the most successful varietal combinations.

1967 *Fedorov, A. I.* (*Utilizing hybrid seed for raising the sugar content of beet for the factory*). (*pp. 181–89*).

Results of trials in 1951–52 showed that hybrid VI526, from V1612 (N) x U751 (E), was equal to V1612 in sugar content and exceeded it by 4·1–5·5 c. of sugar per ha.; hybrid VI524, from V1612 x R632 (E), exceeded V1612 by 0·2% in sugar content.

Intravarietal crossing, using material grown in different localities, often raised the yield of roots and sugar without changing the sugar content; however by growing the material under optimum conditions in 1953–54 such hybrids from R632 gave an increase of 0·2–0·4% in sugar content and of 2–3·8 c. per ha. in sugar yield. Figures are given showing that many of the new varieties, which give considerable improvements in yield of sugar when grown under favourable conditions, are no better than the old ones when grown under poor conditions.

1968 *Kolomiec, O. K.* (*Breeding new varieties of monogerm sugar beet*). (*pp. 190–92*).

The monogerm varieties so far produced in the Soviet Union, while exceeding the majority of varieties in cultivation, are 1–2% below the standard R632 in root yield; they exceed such standards however by 1–5% in sugar yield. Attempts are being made to effect further improvements in them by selecting for large fruits and seeds, germination energy, disease resistance, leaf development, especially at the end of the growing season, and high polarimeter readings, and by growing the seedlings under favourable conditions.

1969 *Sukačev, V. P.* (*Breeding sugar beet for increased sugar content at the Veselyj Podol Breeding Station*). (*pp. 193–97*).

Ordinary hybrids of R06 x Janasz have a sugar yield of 29·8 c. per ha. while those obtained after grafting the two components yielded 35–36·4 c. per ha., these latter hybrids having generally both a larger yield of roots and a higher sugar content. A number of other hybrids between two varieties that have given increased yield and sugar content are mentioned. The same effect has been attained also from summer planting, intravarietal crossing between material grown under different conditions and selection for large number of vascular rings and reduced parenchyma. A plea is made for improved facilities for testing breeding material in a variety of different places and for the study of quality as well as sugar content.

1970 *Čebolda, V. F.* (*Questions of sugar-beet breeding*). (*pp. 198–208*).

The suggestion is made that insufficient attention has been given to sugar content and disease resistance in breeding sugar beet and reference is made to some varieties resistant to *Erysiphe* bred at the Kirgiz sugar-beet breeding station. One of them, K018, has exceeded the standards V25 and M2E in both sugar content and sugar yield when grown under natural conditions. Data are presented which show that the varieties adapted to the short day and high temperature of Central Asia give better results when grown from seed reproduced locally than from seed reproduced in European Russia; the Z types benefit more from wide spacing than the E types.

1971 *Pinčuk, P. D.* (*Increasing the sugar content of sugar beet*). (*pp. 213–17*).

The development of sugar-beet growing in the Baltic States is described. Preliminary figures show that hybrids between E and N varieties in Latvia have a sugar content of 17·8–18·1% compared with 17·1–17·3% in the initial varieties, the respective sugar yields being 52·5–55·5 c. per ha. compared with 51·4–53·0 c. Some selections have shown as little as 0·08% of bolting when spring sown, while others have responded well to square planting.

1972 *Puzikov, D. P.* (*Sugar content of the approved varieties of sugar beet*). (*pp. 218–24*).

The average sugar content of the approved varieties of sugar beet in the USSR rose by 0·7% in the period 1935–54 and the sugar yield per ha. by 3·82 c. The varieties approved during different parts of the period are enumerated; some of the more recent varieties such as Verknjačka 020 and Ramon' 931 are mentioned for their combination of high yield and sugar content. The highest sugar content is found in the Polish variety Janasz 1, the German Kleinwanzleben ZZ and the Russian VNIS04 [Institute of Sugar Industry 04], all of which give, however, lower yields of sugar per ha. Most of the breeding stations failed to raise the sugar content of their varieties during the period, though some of them have issued improved varieties in 1955 and 1956. In many cases the time taken to test and multiply a new variety was greater than the time it remained on the approved list.

1973 *Helemskij, M. Z.* (*Requirements of sugar technology as regards quality of sugar beet*). (*pp. 225–32*).

A number of factors that affect quality are analysed and attention is drawn to varieties such as P232 which, though giving a high yield of sugar per hectare, cause difficulties in the factory because of inferior quality; P408, though identical with P406 in sugar content, loses more sugar in the molasses. Varieties free from bolting and attack by diseases such as *Cercospora* also give juice of higher quality.

1974 *Rakitjanskij, V. K.* (*The requirements of sugar technology as regards quality of sugar beet*). (*pp. 233–41*).

Figures presented show that even varieties classed as having the same sugar content may differ markedly in the proportion of sugars to nonsugars. The varieties defective in this respect, which produce excessive quantities of molasses, are not necessarily those with the highest contents of ash and noxious nitrogen. Variety P410 is the same as P415 in sugar content but from 2,000,000 c. of beets produced 18,000 c. more sugar; it even produced 10,600 c. more sugar than P414, though its sugar content was 0·8% lower. Again, P406 was equal to P408 in root yield, sugar content and yield of sugar per ha. but produced 29,000 c. less sugar per 10,000 ha. from the factory; and P410, though equal to P413 in sugar content, gave 24,000 c. more sugar from 10,000 ha. The approved variety P232 in the Kuban' gives extremely high amounts of molasses and in spite of its high sugar content is less popular in the factories than certain others that are not approved. It is suggested that in breeding sugar beets in the future the lines should be assessed on the basis of their sugar content, root yield and factory behaviour. This behaviour may be affected adversely by manuring designed to increase the root yield.

1975 *Discussion.* (*pp. 244–76*).

In the course of the discussion B. A. Rubin warned against attempts to reduce the content of the so-called nonsugars to the extent of sacrificing some of the mineral compounds necessary for metabolism. D. P. Žetvin questioned the value of releasing new varieties that do not exceed previous ones in total yield of sugar, even if they give higher yields of roots; sugar content and freedom from bolting are considered to be the main selection criteria. M. K. Mel'nik pointed out some defects in the system of seed production in the Soviet Union; A. A. Stankevič replied with some criticisms of the plant breeders, many breeding stations having failed to release varieties suited to their areas; varieties produced by the Ramon' or other stations are still being grown for instance in central Asia, where the extreme climatic conditions require a quite different ecological type. A. D. Černenkov pointed out that the sugar content of Soviet sugar beets has been raised by only 0·4% in the last 15 years and that of the beets reaching the factories has even declined; this is ascribed largely to neglect of the possibilities of square planting, an opinion shared by F. M. Solovej, who emphasized the necessity for carrying out selection at different spacings, by V. V. Japaskurat, who also made a plea for the breeding of varieties with lower contents of nonsugars, whatever their composition might be, and free from bolting and attack by *Cercospora*, and by S. E. Fridman, who enquired why the monogerm varieties have not yet been included in the state variety tests and pointed out some of the difficulties of paying for beets on the basis of sugar content.

1976 Owens, H. S.
Measurement of salt content of beet juices by total acidity.
J. Amer. Soc. Sug. Beet Tech. 1957 : **9** : 466–67.

It is suggested that determination of the total anionic component merits the attention of the breeder as an aid in eliminating low-sugar beet. The method described is based upon use of regenerated resin.

1977 Brykczynski, J.
Bemerkungen über eine wirtschaftliche Bewertung der Zuckerrübensorten. (**Remarks on an economic evaluation of sugar-beet varieties**).
Zucker, Hannover 1957 : **10** : 511–13.

Twenty-four components from which the economic value of a variety may be calculated by means of given formulae are enumerated. An example showing the discrepancy between the relative values of two varieties as calculated from root yield and sugar content on the one hand and according to the present formulae on the other is given.

1978 Zana, J.
Az 1955. évi összehasonlító fajtakísérletek eredményei és az 1951–55. évi kísérleti eredményekből levonható következtetések. (**Results of comparative varietal trials made in 1955 and conclusions to be drawn from the results of 1951-55**).
Cukor. Kutatóint. Közl. 1956 : **1** : 31–42. [From: Hungar. agric. Rev. 1957 : **6** : p. 5. (Abst.)].

The results of trials of 15 Hungarian and Polish sugar beets carried out at various localities in Hungary indicate that relative sugar content and relative ash content are varietal characters but are subject to considerable environmental variation. Noxious nitrogen content showed greater environmental than intervarietal differences.

1979 Roussel, N.
L'influence du retardement de l'arrachage sur le comportement de quelques variétés de betteraves sucrières. (**The influence of delayed harvest on the behaviour of some sugar beet varieties**).
Publ. Inst. belge Amélior. Better. 1957 : **25** : 115–39.

Field trials with eight varieties were carried out at Hesbaye and Hainaut; two sowing dates and three harvesting dates were used to find the effect of the length of the growing period on the sugar yield. The polyploids were found more suitable than E and N varieties for early harvesting.

1980 Schlösser, L.-A. & Koch, F.
Rassenbildung bei *Cercospora beticola.* (**The formation of races in *C. beticola***).
Zucker, Hannover 1957 : **10** : 489–92; p. 539.

Cultures of *C. beticola* from six countries showed clear differences in rate of development, spore production and virulence, when growing on both a susceptible and a resistant variety of sugar beet.

1981 Rapin, J.
Le contrôle cultural des variétés de betteraves à sucre livrées par la Sucrerie et Raffinerie d'Aarberg. Résultats des essais effectués de 1954 à 1956 par les Stations Fédérales d'Essais Agricoles de Lausanne, Liebefeld-Berne et Oerlikon-Zurich. (**The cultural control of sugar beet varieties delivered by the sugar refinery of Aarberg. Results of trials carried out from 1954 to 1956 by the Federal Agricultural Research Stations of Lausanne, Liebefeld-Berne and Oerlikon-Zurich**).
Rev. rom. Agric. 1957 : **13** : 103–06.

Data are provided on yield of roots, foliage and sugar, percentage sugar content, resistance to *Cercospora* and bolting of some E, N and P varieties.

1982 Kargl, R. *et al.*
Srovnávací sortovní pokusy s cukrovkovými semeny v roce 1956. (**Comparative varietal trials with sugar-beet seed in the year 1956**).
Listy cukr. 1957 : **73** : No. 7 : Suppl. 1 : Pp. 56.

In 1956 varietal trials at 22 stations were organized by the Sugar Industry Research Institute at Prague. Data are provided on number of individuals per ha., number of bolters, yield of leaves and their dry matter, yield of roots, content of sugar, noxious nitrogen and ash, composition of juice, sugar yield and MB factor.

1983 Bonciarelli, F.
Confronto fra diverse varietà di barbabietole nella pianura di Foligno. (**Comparison of various varieties of sugar beets on the Foligno plain**).
Industr. saccar. ital. 1956 : **49** : 56–60.

The results are presented of trials of 12 sugar-beet varieties, carried out in the above region of Italy during 1951–55.

1984 Fassi, B.
Premières observations sur une pourriture des racines du manioc causée par un *Phytophthora*. (**First observations on a rot of cassava roots caused by *Phytophthora***).
Bull. INÉAC 1957 : **6** : 313–17.

In the Kibali-Itun district, both sweet and bitter varieties of cassava were attacked by a species of *Phytophthora* which resembles *Ph. erythroseptica*; Criolinha and Nsinga were most resistant.

STIMULANTS

1985 Egri, L.
La culture du tabac en Hongrie. (**The cultivation of tobacco in Hungary**).
Rev. int. Tabacs 1957 : **32** : 195–99.

An outline of tobacco cultivation in Hungary is given; varieties in cultivation are described.

1986 Perucci, E.
Una nuova tecnica per la produzione di semi di tabacchi ibridi. (**A new technique for the production of seed of hybrid tobaccos**).
Atti Mem. Accad. Agric. Sci. Lett. Verona 1957 : **7** : 55–64.

The advantages of using hybrid seed for tobacco growing are expounded and directions are given for emasculation of the seed parents, collection of green anthers from the pollen parents and pollination with a velvet wad. Up to 840 flowers an hour can be pollinated; pollen can be stored for up to 6–7 days and not longer, and flowers are pollinated within four days from emasculation. About 110 kg. of seed can be produced from 10,000 plants, occupying about 3000 ha., and the seed can be stored for up to five years.

1987 Tanaka, M.
(**The influence of X-irradiated pollen on *Nicotiana* crosses. I. On crosses involving tobaccos of the *alata* group**).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 39–44. [Japanese].

Direct and reciprocal crosses between *N. tabacum*, on the one hand, and *N. alata*, *N. langsdorffii* and *N. longiflora*, on the other, using pollen exposed to 0–9600 r. of X rays, were investigated. Slight improvements in seed set were obtained after X irradiation when *N. tabacum* was the mother plant.

1988 Cameron, D. R. & Moav, R.
Inheritance in *Nicotiana tabacum* XXVII. Pollen killer, an alien genetic locus inducing abortion of microspores not carrying it.
Genetics 1957 : **42** : 326–35.

Using a method described earlier [XXII, 2902], a cytogenetic study of introgression from *N. plumbaginifolia* into *N. tabacum* is in progress at the University of California. By selection for black-shank resistance in back crosses, plants carrying 48 *N. tabacum* chromosomes and one *N. plumbaginifolia* chromosome were obtained and it was found that a pollen lethal factor, *kl*, was closely linked with the factor for black-shank resistance, *bs*, on the *N. plumbaginifolia* chromosome. The *kl* gene was found to have no effect in *N. plumbaginifolia* but in the hybrids it caused abortion of pollen carrying 24 *N. tabacum* chromosomes after meiosis but not of pollen carrying the extra chromosome. The killing effect is restricted to pollen mother cell quartets in which the *kl* chromosome is present, no effect on either megaspores or somatic cells being observed. The effect of such a mechanism in speeding up interspecific gene exchange is discussed and it is suggested that loci on the same chromosome as *kl* would be incorporated rapidly into an introgressing population as a result of the selective advantage of pollen grains carrying *kl*.

1989 Murty, B. R. & Swaminathan, M. S.
Cytogenetic studies in derivatives of *Nicotiana rustica* x *N. tabacum*.
Euphytica, Wageningen 1957 : **6** : 227–36.

Two families belonging to the second generation of the sixth back cross of the F_1 of *N. rustica* x *N. tabacum* to *N. rustica* were studied at the Indian Agricultural Research Institute, New Delhi. Both populations were uniform in most morphological characters but showed various meiotic irregularities. The hybrids resembled *N. tabacum* in height, leaf number, leaf shape and panicle type, and were considerably lower in pollen and seed fertility than *N. rustica*. Plants with complete pollen sterility were subsequently found to be asynaptic. The block transference of *N. tabacum* characters, meiotic abnormalities and reduced fertility are explained by assuming that small segments of *N. tabacum* chromosomes had been translocated to the chromosomes of *N. rustica*. Segregation for the mammoth character of *N. tabacum* was observed only in plants kept in the greenhouse. It is suggested that the gene for this character no longer controls day-length response in a *N. rustica* genotype but instead determines an effect of temperature on flowering. The hybrid derivatives had many of the desirable features of both parents and gave a higher yield than *N. rustica*, without reduction in nicotine content. It may be possible to develop commercial strains from the hybrids if their drawbacks of late flowering and reduced seed setting can be lessened by selection.

1990 Ar-Rushdi, A. H.
The cytogenetics of variegation in a species hybrid in Nicotiana.
Genetics 1957 : **42** : 312–25.

Crosses were made between the highly inbred strain *N. tabacum* 'UCBG 06–25' with $n = 24$, homozygous for *wh*, determining white flower colour, on the one hand, and *N. plumbaginifolia* 'UCBG 07–9', $n = 10$, and *N. longiflora* 'UCBG 28–7', $n = 10$, on the other. The hybrid seedlings developed normally for about two weeks but then entered a slow-growing, dwarf phase which lasted from one to six months. The dwarf period was reduced in successive back crosses to *N. tabacum*. All plants which resumed normal growth and reached maturity produced variegated flowers showing streaks of white on a purple background, although the relative area of the white streaks varied both between and within plants. A higher frequency of dicentric chromosomes was observed in the hybrids than in either the parents or in backcross progeny and it is suggested that the higher frequency of variegation in the hybrids may be related to this phenomenon, unequal breakage of bridges leading to the development of cell lineages lacking the genetic material determining flower colour.

1991 Garber, E. D. & Shaeffer, S. G.
Methionine biosynthesis and utilization in *Pseudomonas tabaci* and *Ps. angulata*.
Nature, Lond. 1957 : **180** : 1282–83.

Ps. tabaci is known to produce an exotoxin, detectable by a chlorotic halo surrounding the necrotic focus of infection and behaving as a methionine antimetabolite for the host cells; *Ps. angulata* does not cause a chlorotic halo. When *Ps. tabaci* is attenuated it does not produce the exotoxin and is thus no longer distinguishable from *Ps. angulata*.

None of the methionine-requiring mutants of *Ps. tabaci* induced by ultraviolet irradiation responded to supplementation of the medium with the organic precursors (cysteine, homoserine, cystathionine and homocysteine) or with the inorganic precursors (sulphur, sulphite and thiosulphate) known to be involved in the synthesis of methionine in *Escherichia coli* and *Neurospora crassa*. One mutant required both cysteine and methionine in a specific molar ratio. All the mutants, as well as the two toxigenic parental strains (R2 and S3) of *Ps. tabaci* and *Ps. angulata* '62B', were inhibited by cysteine and homoserine. Both strains of *Ps. tabaci* were resistant to methionine sulphoximine whereas the strain of *Ps. angulata* was sensitive. Nearly all the methionine-requiring mutants were nontoxigenic. Prototrophic reversions of these mutants in most cases showed a recovery of toxigenicity, nontoxigenic reversions being sensitive to methionine sulphoximine. Six independently-isolated mutants of *Ps. angulata* resistant to methionine sulphoximine did not produce a chlorotic halo in tobacco leaves.

1992 Muraoka, Y., Tokitsu, T. & Oka, M.
(Varietal differences in the sensitivity of tobacco to day length under high temperatures and low temperatures).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 24–30. [Japanese].

Ten varieties were subjected to 6, 8, 10, 12 and 14 hr. photoperiods under both high (23–30° C.) and low (10–20° C.) temperatures. They could be classified into three groups: (1) highly sensitive to long photoperiods, mostly late varieties, (2) moderately sensitive to long photoperiods, mostly late or midseason varieties, and (3) insensitive varieties, mostly midseason or early forms. Varietal differences in degree of retardation caused by long photoperiods were more pronounced at high temperatures.

1993 Muraoka, Y., Tokitsu, T. & Oka, M.
(The effect of temperature on the flower-bud differentiation and flowering of Japanese tobacco varieties).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 31–38. [Japanese].

Sixteen local and introduced varieties were planted at monthly intervals from April and August and grown under 8-hr. photoperiods. Intervarietal differences in period to flower-bud differentiation and thence to flowering were in general slight. In Xánthe and Oxford 26, however, the period to flower initiation at the lowest temperature was much larger than in the other varieties. The regression of leaf number on average temperature before flower-bud initiation was similar for most of the varieties with the exception of Xánthe in which it was much lower.

1994 VAN DER VEEN, J. H.
Studies on the inheritance of leaf shape in *Nicotiana tabacum* L.
Proefschr. LandbHoogesch. Wageningen 1957 : Pp. 102.

The varieties Hongaars Gartenblatt [Hungarian Garden-leaf], Atropurpurea, Amersfoorter and Keurhorst Elite were used as parents in the above investigation at the Laboratory of Genetics, Wageningen, Netherlands. The varieties were crossed reciprocally in all possible combinations, data being obtained not only on the F_1 and F_2 but also on back crosses and some triple crosses. Chapter 1 reports the results of a Mendelian analysis indicating that leaf type depends mainly on three pairs of genes, *Ptpt*, *Pdpd* and *Brbr*. *Ptpt* and *Pdpd* have a pleiotropic and cumulative effect upon petiole length, width of leaf wing, width of leaf blade, angle of venation and, in addition, flower shape. They have no effect on total leaf length. *Ptpt* had a markedly greater quantitative effect than *Pdpd*. *Brbr* affects wing width in that it determines the sessile (*Br*) *vs.* petiolate (*br*) conditions. The influence of *Brbr* on the other leaf characters is negligible. Dominant genes at loci *Pt* and *Pd* cause a longer petiole, narrower wings, narrower leaf blades, a more acute angle of venation and flowers with a more slender calyx and corolla and more pointed limb contour. Parental genotypes were established as follows: Hongaars Gartenblatt and Atropurpurea, *ptpt pdpd brbr*; Amersfoorter, *PtPt pdpd BrBr*; and Keurhorst Elite *ptpt PdPd BrBr*. Genes for leaf number modify leaf-base type as determined by *Ptpt Pdpd* genotypes, higher leaf number being closely associated with maximum petiole length. The method of test crossing used to detect *Ptpt* and *Pdpd* genotypes in sessile *BrBr* varieties is described. The carmine flower colour of Atropurpurea, due to *PkPk*, is completely dominant over the pink colour in the other varieties. *Pkpk* is closely linked with *Brbr*. Chapter 1 concludes with a discussion of the literature. Reinterpretations lead to the conclusion that the leaf-shape genes described by other investigators as occurring in tobacco are similar in action to those found by the author. The above results were confirmed by the biometrical study reported in chapter 2, dealing with variation in the shape and angle of venation of the fully grown leaves from the base to the top of the stem in the four parents, their F_1 crosses and the F_2 and back-cross generations of one cross, Hongaars Gartenblatt x Amersfoorter.

1995 TRIFU, I.
Determinarea calității tutunului cu ajutorul analizei chimice a fumului de tutun. (**Determination of the quality of tobacco by means of chemical analysis of the tobacco smoke).**
Lucr. Inst. Cerc. alimenta. 1957 : **1** : 145–62.

Chemical analyses of the smoke of a series of varieties grown in Rumania are recorded. This method is believed to be useful in quality determinations and it is noted, in particular, that the ratio total reducing substances/total N of the smoke is positively correlated with the organoleptic value.

1996 ŠABANOV, D. S.
(A leading tobacco farm in the town of Goca Del'čev).
Tabak (Tobacco) 1957 : No. **3** : 55–58. [Russian].

A high-yielding variety Nevrokop 5 was bred at Goca Del'čev. It produces up to 57·86% of high-grade leaves after heavy dressings of nitrogenous fertilizer and gives less waste in drying than older varieties.

1997 DEBBAGH, K. A.
Tobacco anthracnose: etiology, sources of resistance, and host-parasite relationships.
Diss. Abstr. 1957 : **17** : Publ. No. 20,188 : p. 486.

Of the 25 *Nicotiana* spp. tested for reaction to *Colletotrichum destructivum*, *N. debneyi*, *N. glauca*, *N. langsdorffii*, *N. longiflora* and *N. nudicaulis* were highly resistant and *N. megalosiphon*, *N. palmeri*, *N. stocktoni* and *N. sylvestris* moderately resistant. F_1 hybrids of *N. tabacum* x *N. sylvestris* were intermediate between their parents in resistance. F_1 hybrids involving *N. tabacum* and *N. glauca* were highly resistant when carrying one genome from each parent, but when possessing two genomes derived from tetraploid *N. glauca* they showed only moderate resistance.

1998 PSAREV, G. M.
(Scientific research at the USSR Tobacco Institute in the years of Soviet rule).
Tabak (Tobacco) 1957 : No. **3** : 48–51. [Russian].

Mention is made of new tobacco varieties, with large leaves and immune from mosaic and

Erysiphe, bred at the above Institute. Some of these, for instance Dubec 7, Dubec 566 and Trebizond 161, were obtained by interspecific hybridization involving *Nicotiana glutinosa*.

1999 CLAUSEN, R. E. & CAMERON, D. R.
Inheritance of *Nicotiana tabacum*. XXVIII. The cytogenetics of introgression.
Proc. nat. Acad. Sci. USA 1957 : **43** : 908–13.

A theoretical discussion is given of the cytogenetics of the transfer of the *N. glutinosa* factor for the necrotic type of mosaic resistance to *N. tabacum* by segmental interchange and by substitution of the entire *N. glutinosa* chromosome for the corresponding chromosome of *N. tabacum*.

2000 MIYAMOTO, Y. & KAWAMURA, F.
(The effects of X rays on the pathogenicity and antigenicity of tobacco mosaic virus).
Nihon Shokubutsubyori Gakkai Ho/ Ann. phytopath. Soc. Japan 1954 : **19** : 53–57. [Japanese].

Serologically active virus strains incapable of infecting *Nicotiana glutinosa* were obtained by X irradiation. The loss of infectivity with dose followed a simple exponential curve, suggesting that a single ionization or ionization cluster was concerned.

2001 **Havana 425 tobacco released in Wisconsin.**
What's New Crops Soils 1957 : **10** : No. **1** : p. 24.

The greatest advantage of this new tobacco variety is mosaic resistance, derived from one of its parents, Kentucky 56, the other parent being Havana 307. Growth is rapid, with sucker growth limited to two or three large top suckers. The large thin leaves are rather susceptible to wind and harvesting damage but cure satisfactorily to give a binder type cigar tobacco.

2002 OKA, M. & MURAOKA, Y.
(Inheritance of short-day adaptation in tobacco varieties. I. On Xánthe x Bright Yellow).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 12–16. [Japanese].

F_1, F_2 and back-cross progenies of the above cross were studied to investigate the genetics of short-day adaptation. Leaf number was used as the criterion of photoperiodic response. The assumption that three noninteracting genes were involved fitted the observed data.

2003 HARLER, C. R.
The quality of tea. Part 1—The liquoring properties of varieties of tea.
World Crops 1957 : **9** : 482–84.

The characteristics of seven groups of tea varieties are briefly described and factors influencing the selection of clones mentioned.

2004 PORTSMOUTH, G. B.
Factors affecting shoot production in tea (*Camellia sinensis*) when grown as a plantation crop. IV. Interclonal variations in the effects of apical dominance.
Tea Quart. 1957 : **28** : 30–43.

Prior to the removal of the terminal buds, significant differences existed between five TRI clones in respect of axillary-bud activity of the primary shoots, highly significant correlations being found between yield of cured tea per acre on the one hand and total number of active buds on the 40 central and lateral shoots sampled (+0·9522) and the total number of such buds in the apical zones (+0·9636) on the other. The regression obtained for yield on number of active buds, using the second correlation, indicated that, with a suitable sampling technique involving counts of active buds, clonal yields may be predicted with an accuracy of about ±10%. After removal of the terminal buds, clonal differences in axillary-bud activity were markedly reduced and the correlation between such activity and yield was not maintained. It is suggested that the yield potential of a clone is an inherent characteristic which is inversely related to the degree of apical dominance of the terminal buds.

2005 COSTE, R.
La production caféière et ses problèmes agronomiques dans les territoires d'Outre-Mer. **(Coffee production and its agronomic problems in the Overseas Territories).**
Café, Cacao, Thé 1957 : **1** : 57–62.

Current trends in coffee breeding are briefly discussed; in the Ivory Coast introduced varieties and local forms of *Coffea canephora*, with small beans, are receiving special attention.

2006 **Ninth Annual Report of the Research Department of the Coffee Board, Balehonnur P.O., S. India, 1955-1956.**
Bull. No. 9 : Pp. 115.

Breeding for resistance to leaf disease (*Hemileia vastatrix*) and for a high and uniform yield continued [cf. XXVII, 774]. Within *Coffea arabica*, further crosses were effected among the BA series of selections. An F_3 derivative of S288 x Kent was crossed with a selection of a collection from the Sudan; the latter selection is apparently resistant to the four known races of *H. vastatrix*. Clonal progeny of the BA series remained free from leaf disease under field conditions. The BC_2 of *C. robusta* 'S274' x *C. arabica* 'Kent' to Kent again showed vigour and field resistance to leaf disease. F_1 progenies of interspecific crosses involving *C. robusta*, *C. liberica*, *C. eugenoides* and *C. excelsa* were planted in trial plots. Further crosses of the natural Devamachy hybrids (*C. robusta* x *C. arabica*) with selections of the latter species were effected. The progeny of most of the crosses made earlier between Devamachy hybrids and *C. arabica* have remained unattacked by leaf disease. Trials of clonal progeny of *C. robusta* selections continued. The morphology of the chromosomes of *C. robusta* ($2n = 22$) was investigated; the somatic complement consisted of two pairs of long, two pairs of medium-sized and seven pairs of short chromosomes. Microsporogenesis in this species was regular. Tetraploids of *C. robusta* were induced by colchicine treatment of seedlings at the cotyledonary stage, with a view to hybridization with *C. arabica*. Appendix XVII lists the species, varieties and selections in the collection established at Balehonnur.

2007 Castillo Z., J.
Mejoramiento de café arabica var. *tipica*: utilización del registro de producción de árboles madres. (**Improvement of *Coffea arabica* var. *typica*: utilization of the register of yields of mother trees**).
Cenicafé, Chinchiná 1957 : **8** : 117–44. (Mimeographed).

Yield data were compiled from 2700 trees on an experimental plantation in Colombia in the period 1944–48, after which 54 trees were selected as representing different productivity groups and the yields of the different groups and their progenies were compared in the period 1952–56. Only in 1955–56 were the differences in yield between the groups significant; the maximum and minimum yields occurred in different groups in different years; the highest average yields for the four-year period were given by the groups with a tendency towards biennial bearing. The average yield of the 54 mother trees was 5·67 ± 2·92 kg.; 13 trees yielded more than 8 kg. and of these, 4 gave progenies classed among the best and 1 gave a progeny classed among the worst; this is not much different from the progenies of any group of 13 trees taken at random, the average number of good progenies in this case being 3·03; only 24 trees, that is 4·7% of the total, had yields 50% above the average, and of these trees 16 belonged to progenies with high average yield and 2 to progenies with low. Although the correlations between yields of progenies and mother trees is low, three of the progenies with the highest yield came from selections from the highest-yielding mother trees, which is considerably higher than would have come from selection at random.

Selection of 31 mother trees on the basis of vigour and health alone led to only 3 trees belonging to high-yielding progenies, which was only 0·97%; when other factors such as signs of having produced a good crop were also taken into consideration, the 30 selections contained 10 trees belonging to high-yielding progenies; 30 selections based on diameter of the trunk at a height of 30 cm. contained 16 high-yielding trees.

The correlation between yield of progenies and yield of respective mother plants for the four years was only 0·1965. Correlation of yield of progeny with height of seedling at 7 months was 0·141, with height at 15 months 0·375 and with diameter of trunk 0·379, none of which are considered high enough to serve as a basis for selection; in 10 progenies selected on height 5 were among the highest yielding and in 10 selected on trunk diameter only 3.

A comparison was made of the results of selecting progenies on the basis of the yields of the first two years, the last two and the fourth year alone; in 5 out of 8 progenies the three classifications coincided and these five had the following places in a classification based on all four years: 1, 3, 4, 6 and 7. The yield of the best progenies remained above the average in each of the four years; some of the less good ones showed a tendency to increase from year to year; some progenies showed greater variations from year to year than others and 19 out of the 54 displayed a marked tendency towards annual bearing; these progenies had lower total yields over the period. The progenies also differed in the distribution of their bearing between the October-November and the April-May crops.

Only 6% of the progenies had yields deviating by more than 20% from the mean, above or below, the best progeny, Md-687, exceeding the mean by 46·31%; no other exceeded the mean by more than 16%. Progeny Md-687 was much superior to the rest in vigour, size of branches and diameter of trunk and from its general type would seem to be a hybrid of var. *typica* x var. *bourbon*; it is less prone to breaking than the normal Bourbon type; in respect of certain features the progeny segregated, some plants having a closer resemblance to Bourbon than others and some having a high proportion of empty seeds, the highest being 27·27% in one tree; the seeds were also somewhat smaller in this progeny than in some of the other better progenies but were equal to the average for vars. *typica* and *bourbon*.

2008 Kenmerken van diverse bekende robustaklonen. (**Characteristics of various well-known Robusta clones**).
Bergcultures 1957 : **26** : 571–75.

Notes on the habit, branches, leaves, flower buds, berries and productivity of 19 Robusta clones are presented.

2009 ORLIDO, N. M. & CAPINPIN, J. M.
Morphology and cytology of coffee.
Philipp. Agric. 1957 : **41** : 53–67.

A report is given of investigations on floral structure, flowering periods, microsporogenesis, mitosis, embryology, fruit set and drop, and pea-berry production in *Coffea robusta*, *C. excelsa* and *C. liberica*. Meiosis was regular in all three species, the chromosome number being $2n = 44$.

2010 DUBLIN, P.
Biologie florale du *Coffea dewevrei* de Wild race *excelsa* A. Chevalier. 1re partie. Microsporogénèse et étude du gamétophyte mâle. (**Floral biology of *C. dewevrei* de Wild race *excelsa* A. Chevalier. 1st Part. Microsporogenesis and study of the male gametophyte**).
Agron. trop., Nogent 1957 : **12** : 576–94.

Details are provided of the development, morphology and germination of the pollen grains. Meiosis appeared to be normal and the percentage of viable pollen was high. The presence of large numbers of pollen grains with four pores seemed to be a varietal character; clones differed significantly in the diameter of their grains.

Report on Cacao Research, Imperial College of Tropical Agriculture, St. Augustine, Trinidad, B.W.I., 1955-1956 (1957) : Pp. 60.

2011 *Bartley, B. G. D. & Cope, F. W. Some early observations on seedling progenies.* (*pp.* 7–8).

A report is given on the performance of the first plantings of hybrid and inbred seedling progenies in the 1955 and 1956 seasons at River Estate, Trinidad.

In one experiment, progenies representing four crosses and two inbreds are being studied. The parents comprise the Trinitario parents ICS1, ICS6 and ICS44, and ICS45 and ICS60 which are of Criollo ancestry. Low yields of dry cocoa per acre have been obtained from the inbreds (ICS1 and ICS45) and crosses with Criollo parentage.

A second experiment has been established to compare cuttings of ICS1, ICS6 and ICS8 with the seedling progeny of the three possible crosses among these clones. Cuttings have so far been definitely superior in yield to the crosses. ICS6 is apparently better than ICS1 and ICS8 as a parent.

A third experiment is designed to test the progeny of crosses of ICS1, ICS6 and ICS60 with the witches'-broom resistant clones SCA6 and SCA12. These hybrids merit advanced testing since they have shown considerable precocity in bearing and given higher yields of dry cocoa per acre than other types at the age of three to four years. Hybrids involving SCA6 have proved to be the least susceptible to vegetative and pod infection by *Marasmius perniciosus*. In addition to their possible use in the production of hybrid seedlings for commercial planting, Trinidad–SCA combinations should prove valuable in further breeding for increased yield and disease resistance.

2012 *Holliday, P. Further observations on the susceptibility of Imperial College selections to witches'-broom disease.* (*pp.* 48–53).

Examination of further ICS clones for susceptibility to *Marasmius perniciosus* at River Estate, Trinidad, has confirmed the following earlier observations [XXV, 2277]: (1) clones differ widely in their reactions; (2) a positive correlation exists in general between pod and vegetative infection; and (3) self-sterile clones tend to form more cushion brooms than self-compatible ones. Of the 46 ICS clones now examined ICS95 is clearly the most resistant.

2013 SLABYHOUDEK, K.
Odrůdy úštěckého chmele. (**The hop varieties from Úštěc**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 945–54.

The material used for breeding improved new varieties at the Hop Institute at Žatec and its branch station at Úštěc is described. It comprises a few varieties derived from the wild hops in the province of Úštěc, among them Úštěcký Zeleňák [Úštěc Green] which shows resistance to diseases and Semšův Červeňác [Semš's Red] notable for its good brewing quality.

2014 Nash, A. S.
Production of new varieties of hops in Victoria.
J. Inst. Brew. 1957 : **63** : p. 373. (Abst.)

Breeding undertaken by Carlton and United Breweries Ltd., Melbourne, Australia, in 1950 has resulted in the released variety Ringwood Special, which combines high yield and resin content with improved flavour, its chief advantage being its earlier maturity compared with Cluster. A tetraploid type has produced sterile seedlings from which it is hoped to obtain hops suitable for machine picking. The possibility of inducing useful mutants by X irradiation is being explored.

2015 Howard, G. A. & Slater, C. A.
Evaluation of hops. VII. Composition of the essential oil of hops.
J. Inst. Brew. 1957 : **63** : 491–506.

Analysis of a large number of samples at the Brewing Industry Research Foundation, Nutfield, Surrey, England, by means of a combination of gas-liquid partition chromatography and adsorption chromatography, indicated that variety plays an important part in determining the total essential-oil content. About 20 hydrocarbons are present in the oil and the composition of this fraction appears to be largely controlled by varietal factors. The proportions of myrcene and humulene are inversely related and are in addition correlated with the composition of the α and β acids in the resins. The composition of the oxygenated fraction also appeared to depend upon variety.

2016 Garbuzova, D. A.
(**Promising forms of vegetative hop hybrids**).
Agrobiologija (Agrobiology) 1957 : No. 2 : 70–74. [Russian].

An account of experiments on graft hybridization at Žitomir, with descriptions of some vegetative hybrids, is given. They were obtained by grafting such varieties as Gustjak [Thick], Brewers' Gold, Hallertau, Austett and 3/63 on the Ukrainian standard, clone 18. Most of the hybrids produce high-quality cones, with a strong aroma and high resin content. Austett/clone 18, for instance, yields 1·6 kg. more cones per plant than the standard and has a 2·8% higher resin content.

2017 Vent, L. & Antipovič, D.
Krajové odrůdy chmele a jejich prošlechtování. (**Land varieties of hops and their breeding**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 769–82.

Mention is made of high-yielding clones selected at the Očihov research station among *Peronospora*-resistant varieties originating from Markovarec, Dřevíč, Dučice and Vinařice.

2018 Zub, L.
Próba oceny wartości produkcyjnej klonów chmielu hodowli IHAR w Puławach. (**Attempts to estimate the production value of hop clones bred at the Puławy Institute of Plant Breeding and Acclimatization**).
Roczn. Nauk rol. : Ser. A : 1957 : **76** : 131–56.

Four new clones tested on different soils in Poland over the period 1951–55 gave higher yields, had a higher resin content and produced more uniform cones than the standard. The resin content was also higher than in Czechoslovakian and Soviet varieties.

2019 Méneret, G. & Epp, J.
Les houblons de la récolte 1956. (**Hops from the 1956 harvest**).
Brasserie (undated) : No. 130 : Pp. 11.

The results of varietal trials held at several centres in France and Flanders are reported together with details of chemical analyses of the hops.

MINOR CROP PLANTS

2020 Czabajska, W.
Cytologiczno-ekologiczne badania polskich gatunków arcydzięgla. (**Cytological and ecological investigations on Polish species of angelica**).
Biul. Inst. Roślin leczn. 1957 : **3** : 222–28.

The species *Archangelica officinalis* and *A. litoralis* were similar in chromosome number ($2n = 22$) and chromosome size. Most characters were subject to environmental modifications and the two species were distinguished chiefly by differences in the ribs and wings of the fruit. It is suggested that they should be regarded as subspecies of a single species.

2021 (**The essential-oil rose Novinka**).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 4 : p. 47. [Russian].

The rose Novinka [Novelty] is early, resistant to frost, mildew, rust and spider mites and exceeds the common pink rose by 100% in yield of essential oils, having given 3·85 kg. per ha. in 1956, an unfavourable year.

2022 Theis, T. & Jiménez, F. A.
A vanilla hybrid resistant to *Fusarium* root rot.
Phytopathology 1957 : **47** : 579–81.

Progeny resistant to *F. batatatis* var. *vanillae* have been obtained from *V. planifolia* x *V. phaeantha* at Mayagüez, Puerto Rico. Flowering in the hybrids is erratic and fruit retention is not dependable but fruit quality is better than that of *V. phaeantha*, being similar to that of *V. tahitensis*.

2023 Kormos, J. & Kormos, J. (Mrs.)
Kísérleti adatok a virágos növények morfogeneziséhez. (**Experimental data on the morphogenesis of flowering plants**).
Comm. Sect. bot. Soc. biol. Hungar. 1956 : 207–17. [From: Hungar. agric. Rev. 1957 : **6** : p. 6. (Abst.)].

Nonflowering individuals showing three types of aberrant vegetative growth, viz. normal, rosette-like or with elongated internodes, appeared among the progenies of the *Capsicum* hybrids PB and Cece Red x Longum Nigrum Luteum, especially among the offspring of female-sterile forms. The nonflowering character, which was not influenced by photoperiodic treatment or grafting, appeared to be monofactorially transmitted. Lack of flowers and abnormal vegetative growth are regarded as the result of double mutation in the F_1.

2024 Kormos, J. & Kormos, J. (Mrs.)
A puha paprika. (**Soft red-pepper**).
Növénytermelés 1957 : **6** : 33–34.

Soft-fruited peppers suitable for canning, pulping or juice production but susceptible to transport and storage damage have been produced at Szeged University, Hungary. The soft-fruited character behaves as a simple dominant and has been transferred from the small-fruited green forms in which it was originally found to other types of better quality.

2025 Perlov, R. L. & Kryžanovskij, F. D.
(**An experiment on semiindustrial testing of sweet pepper near Moscow**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.) Moskva-Leningrad 1957 : No. 27 : 108–10. [Russian].

Among early varieties tested in Moscow and Snigiri, Kubanskij Rannij 70/60 [Kuban' Early 70/60], Krupnyj Sladkij 2123 [Large Sweet 2123] and Kalinkovskij 800/7 were distinguished by high yield, good fruit and pleasant flavour.

2026 Lityński, A.
Niektóre zagadnienia hodowlano-badawcze roślin oleistych w świetle badań krajowych. (**Some breeding and research problems concerning oil crops in the light of Polish investigations**).
Hodowla Roślin Aklimatyz.Nasiennictwo 1957 : **1** : 281–304.

In this survey of breeding oil crops in Poland, it is noted that intervarietal differences in winter hardiness and frost resistance have been found in winter rape. Multiplication experiments with spring rape carried out in 1953–56 showed a decline in oil content in successive years in strains developed from single plants with high oil content, while those from plants with medium oil content generally maintained approximately the same level.

Three early and productive new varieties of soya bean are mentioned, namely Warszawska, Młochowska and Mazowiecka.

2027 Toyama, S. & Kumasegawa, T.
[**The chromosome number of *Sapium sebiferum* Roxb. (Forest-tree breeding and fundamental studies on it. XXVIII)**].
Miyasaki Daigaku Gakugei Gakubu Kenkyu Jiho/Miyazaki Univ. Bull. Fac. Liberal Arts Educ. 1956 : **1** : No. **2** : 152–53. [Japanese].

The somatic chromosome number is 88.

2028 Rives, M.
Études sur la sélection du colza d'hiver. (**Studies on the breeding of winter rape**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1957 : **7** : 61–107.

The author has studied the breeding system of *Brassica napus* and confirmed that self and cross pollination are involved in a ratio of 2 : 1. The pure line method is considered to be more suitable than hybridization for the improvement of rape. The rhythm of development and the possible advantage of breeding early varieties are discussed. The correlation between morphological characters and yielding capacity was studied in a number of types at Versailles including Alsace and Alsace x Hamburg hybrids. It is tentatively suggested that the number of seeds per pod and the height of the plant may be used as criteria when selecting for high yield.

2029 Svalöfs Arlo vårrybs tänjer gränserna för våroljeväxtodlingen. **(The Svalöf spring turnip rape Arlo extends the boundaries of spring oil-crop cultivation).**
Allmänna Svenska Utsädesaktiebolaget, Svalöf (General Swedish Seed Co. Ltd., Svalöf) 1958 : p. 34.

Developed from crosses between German and Czechoslovakian varieties, Arlo produces 3% more seed, contains 0·6% more oil and yields 5% more oil than Gute, which it resembles in ripening period and exceeds slightly in straw strength.

2030 KANNO, C. & KOMEMOTO, T.
(On the new variety Suehiro rape).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 179–82. [Japanese].

The above variety, registered as Norin 22 [Ministry of Agriculture and Forestry 22], was selected from Kinki 16 x Hokuriku 4. It is a short, much-branched variety with a high oil content.

2031 KANNO, C. & KOMEMOTO, T. & GOTO, Y.
(On the new rape variety Isuza rape).
Tokai Kinki Nogyo Shikenjo Kenkyu Hokoku/Bull. Div. Pl. Breed. Cult. Tokai-Kinki agric. Exp. Sta. 1956 : **31** : No. **3** : 183–86. [Japanese].

A description is given of the above variety, registered as Norin 23 [Ministry of Agriculture and Forestry 23]. It was selected from Norin 10 swede rape x Wasena [Early] turnip rape. The new variety is early and resistant to diseases and boron deficiency.

2032 ZIMMERMAN, L. H.
Complementary genes for bloom in *Ricinus communis* L.
J. Hered. 1957 : **48** : 242–43.

It was found that in addition to B and b, another gene pair, B_2 b_2, is responsible for the presence and absence of bloom respectively.

2033 GVOZDEVA, Z. V.
(Use of female castor-oil plants for raising the yielding ability of that crop).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. **3** : 140–42. [Russian].

Certain lines showing a marked tendency to the diecious habit have been selected from the collection at the Institute of Plant Industry, Leningrad. Progeny from such plants selected from the variety Rannij Gibrid [Early Hybrid] exceeded those from normal plants in the proportion of purely female plants, yield of seed, size of bunch and number of capsules, without losing the early maturity and short stature of the original variety. The increased yield is ascribed partly to the greater heterozygosity of the progeny which results from the avoidance of self pollination.

2034 TAKEZAKI, M. & NAKAMURA, H.
(On the characteristics of sesame varieties).
Kenkyu Shurokú/Bull. Hyogo agric. Coll. 1952 : **2** : 65–70. [Japanese].

A series of Japanese varieties is classified in respect of the morphological characteristics of the vegetative parts, flower and pod and flowering period.

2035 **Increased demand brings 4 new sesame varieties.**
What's New Crops Soils 1957 : **10** : No. **2** : p. 11.

The varieties mentioned have been described already [cf. 846].

2036 TAKEZAKI, M. & NAKAMURA, M.
(Observations on the place of origin and spread of sesame).
Kenkyu Shuroku/Bull. Hyogo agric. Coll. 1952 : **2** : 55–64. [Japanese].

The origin and history of sesame is briefly reviewed, the author favouring a centre of origin in Africa.

2037 MAZZANI, B.
Híbridos entre sésamos tetraploides dehiscente e indehiscente. **(Hybrids between dehiscent and indehiscent tetraploid sesame).**
Agron. trop., Venezuela 1956 : **5** : 239–46.

In reciprocal crosses involving dehiscent and indehiscent tetraploids, indehiscence being determined by the gene *id* which also affects the form of the seeds, cotyledons, leaves and flowers and lowers fertility, low fertility was transmitted to the F_1 when the indehiscent form was used as ♀ parent. Apart from this the F_1 resembled the normal parent. Segregation ratios for cotyledon form in the F_2 suggested that intermediate forms arise when *id* is in the triplex condition.

2038 HEIMER, H. T.
Sesame makes progress.
What's New Crops Soils 1957 : **10** : No. **3** : 12–13.

The development of nonshattering varieties in the USA is briefly reviewed.

2039 Culbertson, J. O.
Registration of improved flax varieties. VII.
Agron. J. 1957 : **49** : 607–08.

The linseeds Raja and Rocket have been described already [cf. XXV, 1711 and 1712, and XIX, 1479 respectively]. Rocket is a selection from a cross of Argentine 8C x Redwing.

2040 Catalogación de variedades de lino oleaginoso. **(Catalogue of linseed varieties).**
Rev. Invest. agríc. B. Aires 1957 : **11** : 287–98.

Details of the origin and agronomic characters of seven varieties developed since 1925 at agricultural experimental stations in Argentina are presented. Descriptions of most of them have already been summarized from other sources.

2041 Venclavovič, F. S.
(Influence of changing the place of seed production on the later behaviour of sunflower varieties).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 261–70. [Russian].

Seed of four sunflower varieties reproduced for 5–6 years in the vicinity of Leningrad gave rise to plants which differed in a number of respects from plants grown from seed of the same varieties reproduced near Krasnodar; the differences were more pronounced in some varieties than in others. The greatest vigour and resistance to drought and other adversities were obtained by multiplying the seed alternately in the two localities, though the plants reproduced in this way were less uniform. The above qualities deteriorated when the heads were isolated and pollinated from other plants of the same variety.

2042 Broekmans, A. F. M.
Growth, flowering and yield of the oil palm in Nigeria.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 187–220.

An analysis is given of observations collected on leaf production, flowering and bunch yield, in connexion with breeding carried out by the West African Institute for Oil Palm Research, Nigeria. Seasonal variations in growth and flowering may be chiefly ascribed to the marked periodicity of the climate. Climate was found to influence the stage of sexual differentiation and also the critical stage in the development of the leaves and inflorescences when their accelerated growth renders them particularly susceptible to the effect of environmental conditions. No effect of climate upon initiation of leaf and inflorescence primordia was however detected. Growth of both leaf and inflorescence is even during the rainy season but the proportion of ♀ inflorescences differentiated is reduced, probably as the result of the limited supply of sunshine. The dry season is favourable to the differentiation of ♀ inflorescences. Periodicity in bunch yield is thus under the influence of two cycles affecting flowering, one of which has its origin about 30 months and the other about 10 months before harvest. The proportion of ♀ inflorescences may also depend upon the degree of fruiting activity, because of the effect of the latter upon metabolism. Abortion of the inflorescences at the critical stage is most frequent in the axil of leaves opening around August and September, and usually occurs half way between the central-spear and anthesis stages. It is concluded that fluctuation in annual bunch yield of mature palms is largely due to variation in the sex ratio. Leaf production and weight per bunch are not likely to be major factors affecting bunch yield, except in young palms. Floral abortion, although of importance in the case of young palms, does not appear to be a factor limiting bunch yield of mature palms, except in particularly adverse years. The data so far obtained do not suggest that there is in general a positive correlation between sex ratio and bunch yield; these characters may however tend to be related under unfavourable conditions. Possibly the inferiority in the bunch yield of Deli palm progenies, compared with Nigerian progenies, may be partly due to the low sex ratio of the former.

2043 Pronk, F.
Some notes on the influence of artificial pollination upon the production of oil palms.
Trop. agriculture, Trin. 1957 : **34** : 266–68.

In Medan, artificial pollination was found to have no significant effect on the yield of oil from Deli-dura palms.

2044 Chapas, L. C., Tinker, P. B. H. & Ziboh, C. O.
The determination of the oil content of oil palm fruit.
J. W. Afr. Inst. Oil Palm Res. 1957 : **2** : 230–36.

A review is given of investigations carried out on techniques for determining oil content in breeding at the West African Institute for Oil

Palm Research. The method of Vanderweyen, Rossignol and Miclotte has proved to be sufficiently accurate, use being made of the modified equation obtained by Desassis to express the relationship between oil and moisture content of the mesocarp, assuming the dry matter of the pulp to be constant. Procedures used in applying the method are described.

2045 **Report of the Wattle Research Institute, University of Natal for 1956-1957.** Pp. 33.

Analysis of leaf characters in F_2 and back-cross families from green wattle (*Acacia decurrens*) x black wattle (*A. mollissima*) was completed. The problem of combining the desirable characters, probably polygenic, of the two species is considered to be so difficult that an extensive programme of hybridization is not at present to be undertaken. Further examination of the presumed F_2 of *A. mollissima* x *A. baileyana* led to the suspicion that some outcrossing with green wattle or green x black wattle hybrids had occurred [cf. XXVI, 2135].

Selfing of black wattle to develop inbred lines for the production of hybrids continued. Marked differences in various characters were noted between families of black wattle in the progeny trials planted during 1955. Pinnule shedding was much more prevalent in one family than in others; the phenomenon is therefore presumed to be partly genetical. Differences between families in degree of gummosis were significant.

In a group of black wattles selected for progeny testing and propagated by air layering, no relationship was found between diameter at felling and tannin percentage of the bark, as is generally the case. Families derived from a number of these selected trees were sampled for tannin at the age of three and a half years, by taking pellets of bark at intervals up the stem, extracting in cold water and analysing spectrophotometrically. This method gives a good estimate of the relative percentage of tannin but a lower actual percentage than that obtained by the standard hide-power method. It should however be satisfactory for comparison of families.

Seed orchards of black wattle are being established.

Tetraploids have on the whole made slow growth, compared with diploids, and many have misshapen tops. It is not yet known whether flushing behaviour or palatability is connected with the greater susceptibility of the tetraploids to bagworm (*Kotochalia junodi*).

2046 Schick, E. & Reimann-Philipp, R.
Die Züchtung von Heilpflanzen. **(The breeding of medicinal plants).**
Züchter 1957 : **27** : 300–32.

A full review is provided of breeding which has been done to improve the medicinal properties of members of the following genera: *Digitalis, Rheum, Mentha, Salvia, Lavandula, Origanum, Ocimum, Thymus, Matricaria, Anthemis, Achillea, Carum, Valeriana, Atropa, Datura, Hyoscyamus, Lobelia* and *Papaver.*

2047 Kupcov, A. I.
(Utilizing world resources of medicinal plants).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.) Moskva-Leningrad 1957 : No. 27 : 29–32. [Russian].

This article, dealing generally with problems of introduction and acclimatization, refers to difficulties of cultivating some wild species, for instance *Panax ginseng,* in the open. It is thought that this obstacle should be overcome by breeding new forms.

2048 Deufel, J.
Der Azulengehalt tetraploider Schafgarben. **(The azulene content of tetraploid yarrows).**
Pharmazie 1954 (1956) : **9** : 756–58.

Colchicine-induced tetraploidy in *Achillea millefolium* resulted in an increase in number of flowers per plant, number of glandular hairs on the flowers and azulene content of each glandular hair.

2049 Suzuka, O. & Koriba, S.
Male and female sterility in *Artemisia kurramensis* Qazilbash (Preliminary note).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 59–62.

Male-sterile and female-sterile plants detected in material of the above species are described and some data are provided on the inheritance of male sterility in colchicine-induced tetraploid strains.

2050 Suzuka, O., Koriba, S. & Mitsuoka, S.
Studies on tetraploid *Artemisia kurramensis* Qazilbash induced by colchicine treatment.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 63–67.

The growth habit and cytology of induced tetraploid strains are described. The chromosome number ranges from 33 to 38; the modal meiotic configuration is $16_{II} + 4_{I}$. The santonin content is 20% in excess of that of the diploid.

2051 SUZUKA, O.
Studies on the offspring of polyploid *Artemisia kurramensis* Qazilbash.
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 68–74.

Chromosome numbers in the progeny of 4*x* x 4*x*, 2*x* x 4*x* and 2*x* x 3*x* crosses are reported. The chromosome numbers were 33–38 (mode 36), 18–45 (modes 26 and 35) and 18–41 (mode 19), respectively.

2052 DELTSCHEFF, G.
Eine hochalkaloidhaltige Belladonnaart. (**A belladonna species with a high alkaloid content**).
Pharmazie 1957 : **12** : 686–90.

An *Atropa* form thought to be of hybrid origin and having an unusually high alkaloid content in the leaves has been found in Drama, Greece. Segregation in the progeny of the plant indicated that the high alkaloid content was associated with yellow or yellowish-brown flower colour.

2053 ANGULO CARPIO, M. D.
Estudios cariológicos en especies españolas del género *Digitalis*. (**Caryological studies of Spanish species of the genus *Digitalis***).
Genet. iber. 1957 : **9** : 163–85.

D. thapsi, *D. lutea*, *D. ambigua*, *D. purpurea* and *D. obscura* all had 56 somatic chromosomes with 28 bivalents at meiosis. Four SAT chromosomes could be distinguished in each of the first three species.

Annual Report of the Rubber Research Institute of Ceylon 1956 (1957) : Pp. 125.

2054 *de Silva, C. A. Report of the botany department. (pp. 13–39).*

A detailed report is given of the results of trials of (1) hand-pollinated seedling families produced during 1939–45 from crosses among local and foreign parents, (2) clones established from these seedlings and (3) foreign clones and local clones derived from imported seedlings. RRIC8 x Wag6278, PB86 x PR107, PB86 x Wag6278 and RRIC8 x Tjir1 are noteworthy as having given high-yielding progenies, while several clones in group (2) have given 20 lb. or more of dry rubber per tree at various tapping ages. Of the foreign clones, PB86, AVROS255, PB6/50, PR107, RRIM501, PB5/60 and LCB1320 have produced the highest yields. Among the local clones in group (3), RRIC52 is of particular interest. Derived from a Tjidadoe seedling (TKD103) in 1944, it has shown vigorous growth, good bark characteristics and tolerance of shade. Inherently the clone is only moderately productive, its high yield of 25·0 lb. of dry rubber per tree in the fifth year of tapping being partially due to its outstanding girth and length of tapping cut. Hand pollination during 1950–56 has been focussed on more specific crosses than the earlier programme and has included sibbing, half sibbing, back crossing and outcrossing. The *Oidium*-resistant clone LCB870 is no longer to be used as a parent since it has proved susceptible to *Phytophthora* leaf fall and poor in yield. South-American clones resistant to *Dothidella ulei* and in some cases also to *Phytophthora palmivora*, supplied by the Rubber Research Institute of Malaya [cf. XXVI, 3660], are to be used in breeding.

2055 Institut des Recherches sur le Caoutchouc en Indochine. Rapport Annuel 1956. (**Institute of Research on Rubber in Indochina. Annual Report, 1956**) : 1957 : Pp. xix + 165. (Mimeographed).

Details of breeding work and clonal trials carried out at stations in Viêt-Nam and Cambodia are given. The general performance of the new clone IRCI6 has equalled that of PR107 [cf. XXVII, 3372]. Good results were given by several legitimate and illegitimate seedlings.

2056 Uniforme aanduidingen voor *Hevea* plantmateriaal. (**Uniform designations for *Hevea* planting material**).
Bergcultures 1957 : **26** : 486–87.

Recommendations for the standardization of clonal and seedling names and their abbreviations are presented. Three categories of seedling families are recognized: (1) legitimate families, for which both parents are known, usually families resulting from artificial pollination: (2) propelegitimate families for which the mother is known with certainty and the pollen parent or parents with a high degree of probability, as may occur in seed from monoclonal, biclonal or polyclonal plantings; and (3) illegitimate families for which only the mother is known.

2057 BOUYCHOU, J.-G.
Le matériel de plantation. (Recommandations et exploitation). [**Planting material. (Recommendations and exploitation)**].
Caoutchouc, Saigon 1957 : No. 16 : 19–40.

A number of clones of rubber are recommended for use as scions in Indochina; their mineral requirements are mentioned. Seedlings which have done well in Malaya, Sumatra, Java, Cambodia and Viêt-Nam are also listed.

2058 Tan Hong Tong & Helle, C. F.
Leidraad voor het waarnemen van secundaire eigenschappen van hevea-clonen bij het A.P.A. (**Guide to the observation of secondary characters in *Hevea* clones at the General Experimental Station of the General Association of Rubber Planters of the East Coast of Sumatra**).
Bergcultures 1957 : **26** : 359–75.

A survey of the variation in rate and uniformity of growth, habit, quality of bark and latex, resistance to diseases and wind damage, seed yield and quality, flowering, leaf shedding and suitability for grafting is presented with indications of the desirable and undesirable features associated with each character. The importance of selecting for these characters as well as yield is stressed.

2059 Paardekooper, E. C.
De aanleg van rubberzaadtuinen. (**The establishment of rubber seed gardens**).
Bergcultures 1957 : **26** : 513–18.

Recommendations for the lay-out of seed nurseries are presented together with suggestions as to the choice of clones. It is suggested that clones which have been tested as parents be combined with other as yet untested clones.

2060 Paardekooper, E. C.
De *Hevea*-selektie der C.P.V. in vogelvlucht. (**A bird's eye view of the *Hevea* selection work of the Central Association of Experimental Stations**).
Bergcultures 1957 : **26** : 505–13.

The number of clones under trial has now reached 304 and includes numerous introduced clones, 25 *Dothidella*-resistant clones and 128 clones from crosses involving good parental clones. Observations on leaf shedding in relation to mildew infection and bark regeneration are in progress. Late-shedding clones tend to be more heavily infected than early-shedding material. In addition about 5300 seedlings from 61 families are being tested. Among these, the progeny of LCB1320 have shown promise, giving higher yields than grafted PR107.
A new method of selection involving clonal tests at an early stage has been introduced and is expected to be of special use in selection for disease resistance among the highly variable offspring of resistant low-yielding material crossed with productive lines. Two *Dothidella*-resistant lines, F1619 and F4537, have shown resistance to mildew too. In studies of the effects of inbreeding, monoclonal seedlings of LCB 1320, GT 1 and WR 101 are being compared with seedlings from crosses among these three clones.

2061 Liefstingh, G.
Heveaplantmateriaal in de praktijk. (***Hevea* planting material in practice**).
Bergcultures 1957 : **26** : 487–97.

Details of the yields of clones and seedlings in various plantations in Sumatra and Java are presented. The seedlings Tjirl x Tjir16, Tjirl propelegitimate, AV163 illegitimate and LCB1320 propelegitimate [cf. 2056] equalled the clones LCB1320, PR107 and Tjirl on the average and showed less enviromental fluctuation in yield. Under suitable conditions the clones yield more than the seedlings. WR101, GT1 and clones for small-scale planting gave higher yields than the above but require more care.

2062 Liefstingh, G. & Thung Tjiang Pek
Lokale natoetsing van *Hevea* plantmateriaal. (**Local follow-up trials of *Hevea* planting material**).
Bergcultures 1957 : **26** : 497–504.

Details of local trials laid out in Sumatra and Java during 1954–7 with the aim of testing 30 clones which had excelled during primary selection are presented. Observations on the suitability of the clones for bud grafting and on their early growth are included.

2063 Tan Hong Tong
Een beschouwing over een wijze van uitplanten van moderne *Hevea*-clonen met de bijbedoeling om later in deze aanplantingen ook hoogwaardig clonaal zaad te kunnen winnen. (**A dissertation on a method of planting out untested parental *Hevea* clones with the secondary aim of later obtaining valuable clonal seed from these plantings**).
Bergcultures 1957 : **26** : 519–25.

After a discussion of the desirability of systematizing small-scale local clonal trials so as to obtain comparable results from different test gardens in Sumatra and an account of the advantages of seedlings over clonal material [cf. XXVII, 4290], a suitable uniform lay-out for use in such trials is proposed, in which clonal testing may be combined with seed production by planting tested parental clones alongside the untested parental clones, the biclonal seed being collected from the border zone between the two plots.

2064 KOROLEVA, V. A.
(Intraspecific variability and its importance for remoulding kok saghyz into a cultivated plant).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 414–25. [Russian].

Descriptions are given of biotypes comprising populations of kok saghyz at the Institute of Plant Industry. They differ chiefly with regard to growth and flowering habit. A form with a single rosette which does not flower in the first year and another, which has a central flowering rosette in the first year and develops several overwintering axillary rosettes, possess the greatest practical value, as they respond to wide spacing by improvement in root weight, rubber content and quality of rubber.

FRUITS AND NUTS

2065 HEGGLI, M.
Foredling av frukttre og bærvekster. **(Breeding of fruit trees and berries).**
Frukt og Bær 1956 : **9** : 74–82.

A popular survey of breeding methods is presented, with special reference to work on induction of mutation and polyploidy carried out at Balsgård, Sweden, and in England.

2066 SEIDEL, E.
Die internationale Beratung der Länder des sozialistischen Lagers über die Entwicklung des Gemüse-, Obst- and Weinbaus. **(The international advisory service of the countries of the Socialist group on the development of vegetable, fruit and vine cultivation).**
Dtsch. Gartenbau 1957 : **4** : No. 8 : Suppl. : 1–5.

The proceedings of a conference held in Sofia in June 1957 are summarized. General problems of fruit and vegetable breeding were discussed; several speakers emphasized the improvement which could be obtained through use of heterosis. Mičurin's methods were highly recommended and it was suggested that more use be made of local varieties as a basis for selection. Some details are given of work in progress at Plovdiv, Bulgaria, where special attention is being given to tomato breeding.

2067 MÜLLER, H.
Perspektiven der Obstzüchtung, Austausch und Wertprüfung von Obstsorten. **(Perspectives for the breeding, exchange and testing of fruit varieties).**
Dtsch. Gartenbau 1957 : **4** : No. 8 : Suppl. : 5–6.

At the 1957 conference held in Sofia [cf. 2066], breeding problems of individual countries were mentioned. The German Democratic Republic requires frost-resistant pear varieties. Bulgaria has produced a strawberry variety, Sofia, which is superior to Madame Moutot. It was recommended that full descriptions of the best varieties of each country be exchanged; uniform terminology and testing methods were also considered desirable.

Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol, 1956 : Pp. 180.

2068 *Summary of research, 1956. Pomology and plant breeding.* (*pp.* 22–47).

The results of varietal trials with apples and gages are briefly reported. Observations on apomictic seedling stocks of *Malus toringoides* and *M. sikkimensis* were continued; the former was found to set seed without pollination. The triploid cider variety Bulmer's Norman showed good fruit set and seed development in the absence of pollination; the possibility of apomixis is being investigated. The list of recommended varieties of cider apples published in 1948 has been revised.

Selections were made of black-currant seedlings with high ascorbic acid content.

2069 *Williams, R. R. Perry pears for planting.* (*pp.* 48–50).

A list is provided of twenty varieties which have been under observation for four years in the west Midlands; orchard and vintage characters are mentioned.

2070 *Abbott, D. L. Growth substances as fruit-thinning agents for apples: progress report.* (*pp.* 57–60).

Crawley Beauty and Lane's Prince Albert were found to be more sensitive than Laxton's Superb and Millers' Seedling to 1-napthaleneacetamide used as a fruit thinning agent. Branches of Crawley Beauty, which had been sprayed the previous year, gave an increased yield; there was no comparable effect on the bearing of Laxton's Superb.

2071 *Martin, J. T. Studies on the natural protective covering of plants: I. Plant wax in relation to resistance to infection by fungi.* (*pp. 94–100*).

The components of the surface waxy layer on leaves and fruit of five apple varieties were studied. It appears that some of these components are of importance in resisting fungal infection.

2072 *Crang, A. & Sturdy, M. A comparison of some varieties of vegetables preserved by canning and by freezing: progress report V.* (*pp. 167–69*).

The results of processing tests on bean, pea and spinach varieties are summarized.

2073 *Crang, A. & Sturdy, M. A comparison of some varieties of fruit preserved by bottling and by freezing: progress report VII.* (*pp. 170–75*).

Information is provided on the preserving qualities of some varieties of pear, gage, raspberry and strawberry.

2074 A Kertészeti Kutató Intézet, Budatétény. (**The Horticultural Research Institute, Budatétény**).
KisérlÜgy. Közl. 1956 : **50** : 306–19.

The work of the above institute is outlined. It is concerned with breeding and cultivation of fruits and vegetables in different regions of Hungary.

2075 Porpaczy, A.
Hodowla drzew i krzewów owocowych na Węgrzech. (**Breeding of tree and bush fruits in Hungary**).
Prace Inst. Sadownict. Skierniewicach 1957 : **2** : 71–85.

An outline of fruit-breeding work in progress in Hungary is presented. Among apples, attempts are being made to obtain mildew-resistant varieties resembling the extensively grown variety Jonathan by crossing the latter with local varieties. Frost resistance is an important breeding objective in apricot, peach and almond. The widely grown local prune variety Bestercei is undergoing selection for suitability for drying and processing and selection is also being carried out among pears, sour cherries and walnuts. Breeding for vigour is in progress in raspberry and strawberry and a promising new hybrid, *Rubus mohacsyanus*, has been developed from the cross *R. caesius* x *R. idaeus* x *R. loganobaccus* [cf. XXIV, 3337].

2076 Žavoronkov, P. A.
(**Horticulture in the Urals**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : 22–25. [Russian].

Mention is made of new hardy varieties of fruit trees and soft fruits bred at Čeljabinsk, including apricot seedlings with high-quality fruit which overwinter in the open and vine hybrids which ripen a month earlier than southern European varieties and have a sugar content of 15%.

2077 Kantorovič, A. V.
(**Scientific research at the Nikita garden**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 9 : 36–39. [Russian].

Fig. New varieties bred at the Nikita Botanical Garden ripen early and produce high quality fruit. Such varieties as Aromatnyj [Aromatic], Suhofruktovyj [Dried Fruit], Smena [Change], Nikita 2112 and Podarok Oktjabrja [October Gift] have a sugar content of 65–68%.
Almond. Nikita Pozdnocvetuščij [Nikita Late-flowering], Crimean, Soviet, Desertnyj [Dessert], Prjanyj [Spice], Bumažnoskorlupyj [Paper-shelled] and Mjagkoskorlupyj [Soft-shelled] have a thin shell and large kernel. They flower late and thereby escape frost and *Monilia*.

2078 (**Pavel Nikanorovič Jakovlev**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : p. 64. [Russian].

This obituary refers briefly to new varieties of pear and apricot bred by Jakovlev and to a method of grafting developed by him for overcoming incompatibility between distantly related species.

2079 Lund, J. H.
Forsøksvirksomheten innen hagebruk og gartneri til 1950. (**Research work in horticulture and gardening up to 1950**).
Landbruksdirektørens Årsmelding, Oslo 1954 (1957) : Tillegg : Pp. 77.

The vegetable and fruit crops participating in varietal trials and breeding projects at the various Norwegian stations are noted.

Föreningen för Växtförädling av Fruktträd, Balsgård. Verksamhetsåret 1956. (**Association for Fruit-tree Breeding, Balsgård. Working Year 1956**) : 1957 : Pp. 27.

2080 *Nybom, N. Pågående arbetsuppgifter. Avd. I. Kärnfrukter och bärbuskar.* (*Reports of current work. Section I. Pome fruits and bush fruits*). (*pp. 7–12*).

Apple. In breeding for late varieties of attractive appearance and good keeping quality, Lobo has been crossed with Oretorpsrenett [Oretorp Reinette], Ingrid Marie and Millicent Barnes; Cortland with Jonathan, Ingrid Marie and Oretorpsrenett; Oretorpsrenett with Ingrid Marie and Millicent Barnes; and McIntosh with Jonathan. With the aim of obtaining very early summer apples, Gyllenkroks Astrakan has been crossed with Lodi and Milton. In Worcester Pearmain x James Grieve, the former parent has transmitted its attractive colouring to a large part of its progeny. In breeding for scab resistance, McIntosh has been crossed with Woolbrook Pippin and Signe Tillisch with resistant American varieties. Among older crosses, Gyllenkroks Astrakan x Worcester Pearmain, Persikerött Sommeräpple [Peach-red Summer apple] x Gyllenkroks Astrakan, Golden Noble x Cox's Orange and Jonathan x Cox's Orange show promise in respect of appearance and flavour.

A number of varieties have been X or γ irradiated and some seedlings have been treated with ethylene oxide. In Gravenstein, Ingrid Marie and McIntosh, red-fruited and other mutants have been obtained.

Pear. Crosses effected include Doyenné du Comice x Esperens Herre (= Seigneur d'Esperen), Clara Frijs x Doyenné du Comice and Pierre Corneille x Conference. The production of triploids has been attempted by crossing Williams with Parberton (= tetraploid Williams) and Conference with tetraploid Fertility.

A number of full seeds have been obtained from crosses between tetraploid Fertility and the tetraploid apple Balsgård M2812.

The crosses Clapp's Favourite x Doyenné de Juillet, Clapp's Favourite x Colorée de Juillet and Beurré Hardy x Esperens Herre have produced some trees of good quality.

Rubus. Attempts to produce large-fruited forms suited to Swedish conditions by crossing English or American thornless blackberries with hardy Swedish raspberries with doubled chromosome numbers are in progress.

2081 *Oldén, E. J. Pågående arbetsuppgifter. Avdelning II. Stenfrukter, grundstammar, jordgubbar och hassel. (Reports of current work. Section II. Stone fruits, rootstocks, strawberries and hazel). (pp. 12–15).*

Plum. In attempts to obtain plums combining the hardiness of certain American species and the colour of Japanese plums, *Prunus spinosa* is being used as a bridge species in hybridization. Among European varieties being used in breeding are Persikeplommon [Peach plum], which is attractive in appearance, the very hardy local variety Tunaplommon [Tuna plum] and the early plums Ruth Gerstetter and Early Laxton. Early-ripening seedlings with fruit resembling that of Bonne de Bry in size and quality have been found among the progeny of Czar x Bonne de Bry. The offspring of Hardy Blue Seedling contained plants showing good hardiness.

Colchicine and N_2O are being used in inducing chromosome doubling.

Cherry. The late varieties Stor Svart Bigarrå [Large Black Bigarreau], Grosse Germersdorfer [Large Germersdorf], Late Black, Schneiders Späte [Schneider's Late], Noir de Guben [Guben Black], Tradescant's Heart, Bing and Hedelfinger and the large-fruited, firm-fleshed variety Schreckens Bigarrå [Schrecken's Bigarreau] have been used in crosses with the purpose of breeding late, firm-fruited varieties.

Chromosome doubling by means of colchicine and N_2O is in progress.

Strawberry. Further crosses between Senga Sengana and American varieties were effected.

Hazel. Early ripening types with high fruit set and high yields have been found among the progeny of hazel x filbert.

2082 BORDEJANU [BORDEIANU], T., KOČU [COCIU], V. & PANDELE, I.
(Intervarietal hybrids of peach and apricot in the Rumanian People's Republic).
Agrobiologija (Agrobiology) 1957 : No. 4 : 128–38. [Russian].

Breeding work with pome and stone fruits and the Mičurinist methods employed at the Agricultural Institute of the Rumanian Academy of Sciences are discussed and a new variety of apricot and another of peach are described. The apricot hybrid 1–0–49 (♀ Silistra x ♂ Ananas [Pineapple]) combines the high yield and hardiness of the ♀ parent with large fruit and high quality of the other. It has high sugar and vitamin C contents and keeps well. The new peach, Pervaja Pjatiletka [First Five-year Plan], was obtained by pollination of Pozdnij Ševrez [Late Chevreuse] with the pollen of the ornamental peach Amazona rubicunda, which transmitted to the progeny its resistance to frost, pests, *Ascospora* and *Taphrina* without impairing the high quality of the fruit and high yield of the other parent.

2083 LISAVENKO, M. A.
(The orchards in the north-east of Soviet territory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 41–45. [Russian].

This report on breeding fruit trees and soft fruits in districts north and eastwards of the Urals lists some hardy varieties with fruit of fair or good flavour. In particular, mention is made of the apple hybrids 106 and 45 from Minusinsk. They were obtained from Ermolaev's Reinette fertilized by mixed pollen of Bellflower crab + Borovinka + Naliv Belyj [White Juice]. Among the new varieties of soft fruits are the drought-resistant raspberry Visluha [Drooping], hybrids of the black currant Primorskij Champion with wild Siberian forms, hybrids between black currant and gooseberry raised at Novosibirsk, and *Sphaerotheca*-resistant gooseberries and the large-fruited strawberry Aborigen Altajskij [Native of the Altaj] from the Altaj Horticultural Research Station.

2084 Tan, P.-A.
(Grafting technique in ancient China).
Nung-yeh-hsueh Pao/Act. agric. sinica 1956 : **7** : 419–50. [Chinese].

A short historical survey of grafting horticultural plants in China from the fifth century onwards is presented. Possible adumbrations of Mičurin's views on heritable interactions between stock and scion are quoted.

2085 Pedrini, E.
Le varietà di pesco, pero e susino Morettini. **(Morettini varieties of peach, pear and plum).**
Frutticoltura, Bologna 1957 : **19** : 558–64.

Brief descriptions are given of 11 varieties of peach and two each of pear and plum developed by Morettini in the last 30 years at the Centre for Breeding Fruits and Vegetables of the Institute of Arboriculture, University of Florence.

2086 Carlone, R.
Lo stato attuale della frutticoltura in Cina. **(The present condition of fruit growing in China).**
Genet. agr. 1957 : **7** : 83–110.

Mention is briefly made of the better known varieties of species of *Malus*, *Pyrus* and *Prunus* grown in different parts of China.

2087 Alderman, W. H., Wilcox, A. N. & Weir, T. S.
Fruit varieties developed at the University of Minnesota Fruit Breeding Farm.
Bull. agric. Exp. Sta. Minnesota 1957 : No. 441 : Pp. 35.

Descriptions are given of apple, pear, plum, cherry, raspberry, gooseberry, red currant and strawberry varieties.

2088 Rudkovskij, J. P.
(Local varieties an integral part of horticulture).
Priroda (Nature), Leningrad 1957 : No. 8 : 105–05. [Russian].

References are made to local varieties of apple, pear and plum from the Krasnodar territory which are long-lived, vigorous and highly productive. The apples Myceby, Al'mė and Myčezen yield up to 1600 kg. per tree as against 160–180 kg. in the standard varieties. The pears Hutemė and Bžihakuž and the plum Hacepkė outyield the common standards by a similar margin.

(Biochemistry of fruits and vegetables).
Akad. Nauk SSSR, Moskva 1955 : No. 3 : Pp. 292. [Russian].

2089 *Rubin, B. A. & Četverikova, E. P.*
(The role of oxidizing processes in the resistance of cabbage to Botrytis cinerea*).*
(pp. 43–78).

Studies of respiration in three cabbage varieties, Amager, Nomer Pervyj [Number One] and Moskovskaja Pozdnjaja [Moscow Late], showed that in the late variety Amager, which keeps well, the peroxidase activity and respiration rate during storage were higher than in Nomer Pervyj. Similar studies on *B. cinerea* showed that enzymes capable of oxidizing ascorbic acid and aminoacids are common to the fungus and the host, whereas peroxidase and cytochrome oxidase are present only in the cabbage and polyphenoloxidase only in the parasite. In all three varieties respiration rates increased when the leaves were attacked by *B. cinerea* or when the tissues were infiltrated with a culture medium on which *B. cinerea* had been growing, though the medium itself did not contain oxidizing enzymes; the increase was greater in Amager, which is resistant to *B. cinerea*, than in the other two. The cytochrome oxidase was inhibited and the ascorbic-oxidase activity reduced in infected tissues but the peroxidase activity increased in Amager and to a lesser extent in Moskovskaja Pozdnjaja; in Nomer Pervyj, which is the most susceptible of the three varieties, the peroxidase activity was low in healthy leaves and was not increased by infection.

The enzyme systems controlling respiration in the three varieties were different: the resistant variety Amager displays greater peroxidase activity and greater activity of those respiration processes that are catalysed by nonmetallic oxidases, whose action is not inhibited by HCN and NaN_3; both these processes are activated rather than inhibited by the toxin from the parasite. On the other hand respiration in the susceptible variety Nomer Pervyj is controlled more by ascorbic oxidase, the activity of which is reduced by the toxin. In Moskovskaja Pozdnjaja the peroxidase activity was reduced by the toxin and only the respiratory activity controlled by nonmetallic oxidases was somewhat increased.

2090 *Gulidova, I. V. (Characteristics of the carbohydrate metabolism of leaves of sugar and tonnage types of sugar beet). (pp. 79–89).*

When transferred from Voronež to the cooler region of Moscow, the tonnage variety R2992 reduced the sugar content of its roots to a greater extent than did the sugar variety R3020. In the latter variety the breakdown of sucrose in the leaves and its transference to the roots was less interfered with at reduced temperatures. On the other hand synthesis of sugar in the leaves was most intensive at 40° C. and diminished very much with reduction in temperature, whereas no such diminution occurred in the tonnage variety.

2091 *Kokin, A. Ja. & Vilkova-Malyševa, A. G. (Some data on the biochemical characteristics of frost resistance in different varieties of apple). (pp. 90–106).*

Analyses of a number of varieties in the Finno-Karelian Republic showed the peroxidase activity to be greater in susceptible than in hardy varieties; the starch content of one-year shoots was higher in late-ripening varieties, which are also the most hardy; Borovinka, which is not hardy, provided an exception, since its shoots contained as much starch as the hardy group. The hardy varieties also had a higher tannin content in their leaves at all times of the year.

2092 *Gerštejn, L. A. (Some data on the biochemistry of sweet potato). (pp. 145–62).*

Data are given on contents of dry matter, carbohydrates, sugars, monosaccharides, sucrose and starch for a number of varieties grown in the Soviet Union. The highest starch contents were in the varieties Rekordnyj [Record] and Kartofel'nyj [Potato] and the highest sugar content in Lučšij iz Vseh [Best of All] and Pervenec SSSR [USSR Firstborn]; the last-named variety is also distinguished for its high yield.

Further data are presented on the changes in chemical composition that occur during development and storage.

2093 *Žurbickij, Z. I. (Biochemical characteristics of vegetables grown in various regions of the Nonchernozem Zone). (pp. 176–95).*

Twelve varieties of cabbage were analysed in 1938–40 and data are given for reducing sugars, sucrose, total sugars, nitrogenous substances, cellulose, vitamin C and sugar as a percentage of the dry weight. Early varieties contained less sugar and nitrogenous matter, both of which were highest in the midseason varieties.

Similar data for 11 onion varieties showed the more pungent varieties to have a higher proportion of sucrose and the less pungent a higher proportion of reducing sugars; very little correlation was found between pungency and ethereal oil content.

For tomatoes the results varied in different years but in general the best varieties proved to be Štambovyj Alpat'eva [Alpat'ev's Bush], John Baer, Earliana and Štambovyj 906 x Krasnoznamennyj [Red Flag]. For hothouse culture the best were Break o'day, Pritchard, Pritchard x Planovyj [Planned] and Planovyj x 12.

In peas, Neistoščimyj [Inexhaustible] proved the best among the sugar peas, having a protein content of up to 2·5%; in the shelling varieties Märgärt [Marrow-fat pea] had the highest sugar content, with 1·47%. All the French-bean varieties were lower than the peas in content of reducing sugars, proteins and vitamin C.

2094 *Frančuk, E. P & Kulik, A. A. (The nature of the quantitative variation of the chemical composition of the fruits of Mičurin and other varieties in different geographical regions). (pp. 196–220).*

Data on sugar content in seven strawberry varieties show the extent to which it differs according to the area in which they are grown; all varieties increased their sugar content when grown under favourable conditions but some did so more than others; however, the order into which the varieties fell with respect to sugar content and acidity remained the same in different places and in different years. The same was true of raspberries and black currants, which varied less than strawberry varieties, and of sour cherries and apples, which varied least of all.

2095 *Renard, G. K. (The biochemical characteristics of the Omsk forms of sour cherry and plum). (pp. 240–49).*

Data are given on the content of dry matter, malic acid, reducing sugars, sucrose and total sugars for cultivated forms of *Prunus fruticosa*, *P. domestica*, *P. ussuriensis* and a hybrid known as the Karzinskaja plum.

2096 Jaarverslag 1956. Proefstation voor de fruitteelt in de volle grond, Wilhelminadorp (bij Goes). [**Annual report, 1956. Wilhelminadorp (near Goes) testing station for fruit cultivation in the open**]. Pp. 87.

Information on current trials of rootstocks of apple, pear and plum and strains of strawberry, black currant, red currant and raspberry is included in this report.

2097 Kuckuck, H.
Wie werden heute leistungsfähige Gemüse- und Obstsorten geschaffen? (**How are productive vegetable and fruit varieties produced today?**)
Arch. dtsch. LandwGes. 1957 : **19** : 43–49.

Methods used in vegetable and fruit breeding are described with special reference to apple breeding.

2098 Nesterov, Ja. S.
(**Biology of growth and fruiting of the Mičurin varieties of apple in the zones of the foot hills of the North Caucasus**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. **3** : 197–210. [Russian].

Some of the Mičurin varieties that have done well in different parts of the North Caucasus are enumerated and data are presented showing their frost resistance; the hardiest have proved to be Antonovka Šestigrammovaja [Sixty-gramme Antonovka], Candille Record and Šafran-Kitajka [Saffron Crab]. The flowers and young ovaries of these varieties are less damaged by late spring frost than those of southern varieties; the Mičurin varieties as a whole shed their leaves earlier in the autumn and are more resistant to diseases and pests, there being varieties that are resistant to scab, leaf spot, mildew and fruit rot; the late varieties do not keep so well as the local forms. The yields from the Mičurin varieties are as good as those from the local apples or better and some of them bear annually; in flavour they are as good as many of the local apples, some of them having a sugar content of up to 11%.
Suitable pollinators are recommended.

2099 Blair, D. S., Spangelo, L. P. S. & Beingessner, H. F.
Trends in apple breeding.
Ninety-third Annual Report of the Nova Scotia Fruit Growers' Association, 1956 : 15–24.

Breeding aims and new varieties are discussed with reference to trends in production and consumer demands in Canada.

2100 Karpov, G. K.
(**A worthy disciple and successor of I. V. Mičurin**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : 60–61. [Russian].

This biographic note on S. F. Černenko, written on the occasion of his eightieth birthday, refers to apple varieties that he has bred at Mičurinsk. Most are hardy varieties with good-quality fruit. The early ones ripen in July, the late ones in September. Some of them, in particular Bogatyr' [Hero], Uspeh [Success] and Pepin Černenko [Černenko's Pippin], keep till July. Mention is made of parental varieties which give useful hybrids under Mičurinsk conditions.

2101 Li, Y.-H.
(**The inheritance of some characters in apple crosses**).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 220–27. [Chinese].

Information is provided on the inheritance of the appearance, flavour, consistency of the flesh and size of the fruits, and maturation date in F_1 hybrids involving a series of Chinese and introduced varieties. The inheritance of reaction to *Phyllosticta pirina* was studied in three crosses.

2102 Murawski, H. & Wieloch, E.
Zur Eignung von Malus-Artbastarden für die Obstverwertung. (**On the suitability of *Malus* interspecific hybrids for fruit utilization**).
Dtsch. Gartenbau 1957 : **4** : 260–62.

Seedlings from the cross Ernst Bosch x *M. niedzwetzkyana* produced high yields of fruit, which proved to be satisfactory for making jam, mineral waters and dessert wines. The hybrids differed with respect to the composition of the fruit juice and the distribution of anthocyanin in the flesh.

2103 Breglia, G.
L'Annurca, pregevole varietà di melo della Campania. (**Annurca, a valuable apple variety from Campania**).
Frutticoltura, Bologna 1957 : **19** : 361–66.

The variety is described as having bright red fruits of good flavour and keeping capacity; in spite of its irregular bearing it is not thought advisable to replace Annurca by Abundance or other varieties.

2104 Gerritsen, J. D.
Het nieuwe appelras Lucullus. (**The new apple variety Lucullus**).
Fruitteelt 1958 : **48** : p. 4.

Developed at the Laboratory for Horticultural

Plant Cultivation, Wageningen, Netherlands, from a cross between Jonathan and Cox's Orange Pippin, Lucullus has fruits attractive in appearance and good in flavour. The yield, though not high, is regular, the fruit ripening at the same time as or a little earlier than Cox's Orange; the keeping quality however is not so good.

2105 ZIELINSKI, Q. B.
Apple varieties for Oregon.
Sta. Bull. Ore. agric. Exp. Sta. 1957 : No. 563 : Pp. 30.

Promising new varieties and successful old varieties of apple are briefly described. Season, quality, pollination and adaptability are mentioned. Some crab types are also recommended.

2106 ABRAMOV, N. A.
(Some conditions responsible for the length of the "dormant period" in apple and pear seed).
Agrobiologija (Agrobiology) 1957 : No. 3 : 59–66. [Russian].

The pollen parent induced directed changes with regard to dormancy period in hybrids between (1) a cultivated apple variety and crab and (2) a cultivated pear and *Pyrus ussuriensis*.

2107 ZAEC, V. K. & SEDOV, E. N.
(The effect of external conditions upon selectivity of fertilization in the apple).
Agrobiologija (Agrobiology) 1957 : No. 3 : 67–71. [Russian].

Selectivity of fertilization, as indicated by a high fruit set and good development of fruit and seed, was studied at Mičurinsk. It was found that a variety grafted on a definite stock preferred pollen from a tree or trees of the same variety grafted on another stock to self pollen. A variety always showed special pollen preferences irrespective of whether it was grown on its own roots or grafted on a *Malus sylvestris* stock. Fertilized by mixed pollen from different trees of its own variety, a tree set fewer fruits and produced smaller fruits with fewer seeds than when it was open pollinated. But it set more fruits and their weight and seed content increased when pear pollen was added.

2108 MALIGA, P.
A Jonathán alma termékenyülési adatai. **(Data on the fertilization of Jonathan apples).**
Kertész. szőlész. Főiskol. Évkön. 1954 : **1** : 25–41.

The results of experiments on the compatibility relationships of Jonathan and other apples, including native Hungarian varieties, are presented. Fruit set in Jonathan was 1·6% after selfing and 11–35% after cross pollination. Astracháni piros [Astrachan Red], Royal Short-Stalk, Landsberg Reinette and Szász pap [Saxon Priest] were partially self fertile.

2109 HJELMQVIST, H.
The apomictic development in *Malus Sieboldii*.
Bot. Notiser 1957 : **110** : 455–67.

Two specimens of *M. sieboldii* from the Botanical Garden at Lund, Sweden, form megaspore mother cells which undergo meiosis and in some cases give rise to embryo sacs. In many cases however, especially in one of the specimens, meiosis is disturbed and the megaspores either fail to develop or degenerate while neighbouring cells enlarge and form unreduced embryo sacs. From these and earlier observations [cf. XXIII, 2938] it is concluded that the species is a facultative apomict. In discussing the relationships of *M. sieboldii* it is suggested that it forms part of a form complex including *M. zumi*, *M. sargenti* and others, which has arisen partly through hybridization with *M. baccata* var. *mandshurica* and possibly also with *M. prunifolia*.

2110 BÖHM, G.
Beitrag zur autovegetativen Vermehrung einiger Apfelsorten. **(A contribution to the reproduction of some apple varieties on their own roots).**
Dtsch. Gartenbau 1957 : **4** : 241–44.

Of the twelve varieties studied, James Grieve, Goldparmäne [Golden Pearmain], Berlepsch and Croncels had the greatest rooting capacity.

2111 MATZNER, F.
Über mikrobielle Hemmstoffe in Äpfeln. **(On microbial inhibitors in apples).**
Arch. Gartenb. 1956 : **4** : 296–303.

Fruit juice from several varieties was found to differ in its inhibitory effect on the growth of four species of bacteria; this action may be related to the acid content of the fruit. Juice from Gold Parmäne [Golden Pearmain] inhibited the growth of yeast and *Aspergillus niger* but promoted the growth of bacteria.

2112 CARLONE, R.
Le specie del genere *Malus* (Miller) esistenti in Cina e loro utilizzazione in frutticoltura. **(The species of the genus *Malus* Miller existing in China and their use in fruit growing).**
Genet. agr. 1957 : **7** : 278–304.

In this taxonomic study reference is briefly made to the more important varieties.

2113 Loh [Lo], C.-N., Chao, D. B. [Chao, T.-P.] & Wu, K.-Z. [Wu, K.-H.]
(Fruit injury of apples in Yentai).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 228–33. [Chinese].

Data are provided on the damage caused to varieties of apple, *Malus soulardii* and *M. prunifolia* by a late April frost in 1956 at the above locality in Shantung, northern China.

2114 Abdurahmanov, S. G.
(Horticulture in the Kirgizian SSR and ways of promoting it).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 8 : 27–33. [Russian].

A reference is made to apple hybrids bred at the Kirgizian Agricultural Institute. These are productive and hardy at an altitude of 1600 m. in the Kočkorskij district.

2115 Byrde, R. J. W.
The varietal resistance of fruits to brown rot. II. The nature of resistance in some varieties of cider apple.
J. hort. Sci. 1957 : **32** : 227–38.

A more detailed study on the lines of that reported earlier [XXII, 830] has been carried out. Evidence has been obtained suggesting that the resistance to *Sclerotinia fructigena* of some high-tannin varieties of apples arises, in part, from the reduction of the activity of macerating enzymes, produced by the fungus, by oxidized polyphenols produced in the injured tissues.

2116 Kirkham, D. S.
Studies of the significance of polyphenolic host metabolites in the nutrition of *Venturia inaequalis* and *Venturia pirina*.
J. gen. Microbiol. 1957 : **17** : 120–134.

Millers' Seedling and Cox's Orange Pippin apples and Conference and Williams' Bon Chrétien pears were studied. The author concludes that qualitative and quantitative differences in polyphenolic host metabolites and their relation to nutritional factors are of importance in varietal resistance to *Venturia*.

2117 Kedrin, S. P.
(The apple variety Želtoe Rebristoe 3246).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : p. 96. [Russian].

Želtoe Rebristoe 3246 [Yellow Ribbed 3246] (Antonovka Šafrannaja [Saffron Antonovka] x London Pippin) from Kujbyšev is distinguished by high yield, resistance to scab and good keeping properties. It is hardier than Bellflower crab and produces fruits larger than those of Babaškino [Granny's]. It retains its flavour from September till March.

2118 Bauckmann, M.
Untersuchungen über eine termingerechte Bekämpfung des Apfelwicklers (*Carpocapsa pomonella* L.) unter Berücksichtigung des Falterfluges. **(Research on the right time for control of *C. pomonella* L. with regard to the flight of the moth).**
Arch. Gartenb. 1956 : **4** : 253–76.

Varietal differences in attack by *C. pomonella* were observed after spraying with insecticide. The preference of the insect for certain varieties may be related to the nature of the skin and the aroma of the fruit; also the insecticide does not adhere so well to smooth fruit. Anurka and Simirenko were the most resistant of the varieties observed.

2119 Pruss, A. G.
(The pear in the province of Leningrad).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 219–23. [Russian].

The more recent varieties of pear have a sugar content of 8·30 to 10·31% in their fruits, compared with 6–7% in the older varieties. Brief descriptions are given of the most promising varieties.

2120 Howlett, F. S.
Preliminary evaluation of new and uncommon pear varieties including comparison with standard sorts.
Res. Bull. Ohio agric. Exp. Sta. 1957 : No. 790 : Pp. 131.

Illustrated notes are provided on 138 varieties and strains, which are new to America and on some standard varieties, included for comparison. Blight resistance, appearance, flavour and keeping quality of the fruit and season of harvest are mentioned.

2121 Kovalev, N. V. & Kalmykov, S. S.
(The origin of the cultivated pears of Central Asia).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 211–18. [Russian].

Fifty seedlings from a tree of *Pyrus bucharica*, which is regarded as a hybrid of *P. regeli* x *P. korshinskii*, were examined and arranged into groups, the characteristics of which are described. The fruit weight varied from 20 to 150 g., some of the fruits being superior to those of the parent tree in quality. Variation occurred in respect of a number of other characters, certain seedlings having features resembling *P. sogdiana*. The pears growing in the gardens of Central Asia are very mixed in origin, having arisen by cross pollination with the participation of *P. bucharica*, *P. sogdiana* and *P. asiae-mediae* as well as, more recently, cultivated forms of *P. communis*.

2122 DOWRICK, G. J.
Abnormal gametogenesis and embryo abortion in *Pyrus communis*.
Heredity 1957 : **11** : p. 426. (Abst.).

The information presented in this abstract has already been summarized [XXVI, 3061 and XXVII, 3770].

2123 CARLONE, R.
Le specie del genere *Pyrus* originarie della Cina e loro utilizzazione in frutticoltura. (**Species of the genus *Pyrus* originating in China and their use in fruit growing**).
Riv. Ortoflorofruttic. ital. 1957 : **41** : 375–89.

A key is provided for the identification of the 12 species of *Pyrus* growing in China and eight of these, three of which are grown for their fruit, are described, mention being briefly made of some of their more important varieties.

2124 BERGANN, F.
Gelungene experimentelle Entmischungen und Umlagerungen bei bekannten oder vermuteten Periklinalchimären. (**Successful experimental dissociation and regrafting in known or suspected periclinal chimeras**).
Ber. dtsch. bot. Ges. 1957 : **70** : 355–60.

The experimental material included the graft chimera *Laburnum adami* and *Crataegomespilus asnieresii*; a procedure, involving the removal of all the buds from the chimeral shoot, is recommended for separating chimeral apple sports into their component parts.

2125 DOLGUŠIN, D. A.
(**A plum shoot originating from an apricot**).
Agrobiologija (Agrobiology) 1957 : No. 2 : 44–46. [Russian].

In Odessa an apricot gave rise to a plum shoot; it was 23 cm. higher up the trunk than a lateral into which a plum bud had been inserted some years previously.

2126 LYSENKO, T. D.
(**Some remarks concerning the report on a plum shoot originating from an apricot**).
Agrobiologija (Agrobiology) 1957 : No. 2 : 47–48. [Russian].

The writer attributes the appearance of the plum on an apricot to interspecific conversion and refers in this connexion to other reports of conversions [cf. XXIII, 1501 and 1506] which are stated to have been criticized in a tendentious manner in the *Botaničeskij Žurnal*.

2127 CAPUCCI, C.
Una nuova varietà di albicocco. La selezione C. Capucci N. 1. (**A new apricot variety. C. Capucci selection 1**).
Frutticoltura, Bologna 1957 : **19** : 437–41.

This variety, selected by the author from a specimen of Reale d'Imola [Imola Royal] at the Institute for Tree Cultivation of the University of Bologna, is adapted to the Emilia region of Italy. It flowers a few days later than Reale d'Imola and the medium-sized fruit matures eight to ten days earlier.

2128 ABDULLAEV, A. A.
(**The achievements of Tajik horticulturists and viticulturists**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 46–48. [Russian].

Mention is made of some varieties of apricots and vines raised in Tajikistan. Among the former are Arzami-Katta, Mirsandžali, Suphany, Isfarak, Kandak and Hurmai which are used for preparing high quality dried fruits. Among the vines are the high quality sultana Kišmiš Černyj [Black Sultana] and the dessert variety Tajfi Rozovyj [Pink Tajfi].

2129 GUDZENKO, A. A.
(**New plum varieties for Kazahstan**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 44–46. [Russian].

New hardy and productive varieties have been obtained at Karaganda from interspecific hybrids of *Prunus nigra* x *P. triflora* and from seedling selections of *P. triflora*. Among the varieties of the former category are the large-fruited Dolinskaja Krasavica [Dolinka Beauty] and the early-ripening Dolinskaja Višnevaja [Dolinka Cherry].

2130 VORONČIHINA, A. JA.
(**A valuable plum variety**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 46–48. [Russian].

Mičurin's variety Renklod Kolhoznyj [Kolhoz

Gage] outyields most varieties in the Voronež province and surpasses the majority in earliness, hardiness and quality. In addition it is thought to be a valuable component for crosses with Victoria, Ekaterina and some Mičurin varieties. Hardy and productive seedlings of Renklod Kolhoznyj, with fruits larger than the mother variety, were obtained by open pollination.

2131 BOGOLJUBOVA, O.
(The myrobalan in the province of Leningrad).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 8 : p. 74. [Russian].

Rannjaja [Early], Oval'naja [Oval] and Krupnoplodnaja [Large-fruited] were selected at the Institute of Plant Industry. They are drought resistant and hardy under Leningrad conditions and yield 65–120 kg. of fruit per tree. The fruit is less astringent than that of varieties grown in southern Russia.

2132 HURTER, N.
Breeding better plums at Bien Donné.
Fmg. in S. Afr. 1957 : **33** : No. 9 : 49–51.

Some problems and results of the breeding initiated seven years ago at the Bien Donné Experimental Farm, Western Province, South Africa, are discussed. Special attention is being paid to resistance to delayed foliation, fruit size and disease resistance.

2133 ENIKEEV, H. K.
(The question of the origin of large-fruited forms of sloe and damson).
Agrobiologija (Agrobiology) 1957 : No. 4 : 139–48. [Russian].

The F_1 from crossing *Prunus domestica* with *P. spinosa* at Birjulevo, Moscow province, had low fertility. The F_2 gave segregates of *P. domestica* with 48 chromosomes, small-fruited sloes with 40 chromosomes and large-fruited sloes and damsons with 40–48 chromosomes. The last two types resembled large-fruited sloes and damsons found in the Volga Basin and it is thought that these must have arisen in the same way. An account of breeding high-yielding and hardy plum-sloe hybrids with fruit of high quality, together with descriptions of a few hybrids that have been selected, is given.

2134 FINAEV, E. P.
(The plum variety Gruševidnaja).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 95–96. [Russian].

Gruševidnaja [Pear-shaped] (Očakovskaja Želtaja [Yellow Očakov] x Ternosliv Volžskij [Volga Damson]) from Kujbyšev ripens earlier than the ♀ parent and yields more than twice the amount of fruit. It is hardy and shows resistance to drought and gummosis. The fruit is large and of high quality.

2135 RĂDULESCU, C. & CVASNÎI, D.
Soiuri locale de prun din valea Dîmboviței.
(Local plum varieties in the valley of the Dîmbovița).
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 413–28.

Fourteen local varieties are described, information being provided on the quality of the fruits. They are used principally for making jam and plum brandy.

2136 TUPICYN, D. I.
(The dormancy period and microsporogenesis in the plum).
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 457–61. [Russian].

Data on dormancy period and microsporogenesis in *Prunus domestica*, *P. spinosa*, *P. munsoniana*, *P. cerasifera*, *P. sogdiana*, *P. salicina*, *P. simonii*, the plumcot 'Tlor Čiran' and the apricot 'Ahrori' are presented. The development of archesporial tissue during dormancy under the conditions of Taškent occurred in all these forms, and the formation of pollen mother cells was always observed on the termination of dormancy.

2137 BARANOVA, A. P.
(Distribution of sour cherry and plum varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 51–53. [Russian].

Compatibility studies showed that all the sour-cherry varieties tested, except Ljubskaja and Plodorodnaja Mičurina [Mičurin's Prolific], and most plum varieties were practically self sterile. Fertilization with pollen mixtures of two or three varieties gave an appreciable improvement in the set of such sour cherries as Ljubskaja and Vladimir, as compared with pollination by a single pollinator. The set of the plum Skorospelka Krasnaja [Early Red] was also higher when it was pollinated with mixed pollen of two varieties instead of pollen from one variety.

2138 SEMENOV, N. I.
(Attend more to the cultivation of the plum).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : 33–34. [Russian].

Jubilejnyj 218 [Jubilee 218] (Izjum Érik [Érik Raisin] x Vengerka Ital'janskaja [Italian prune]), bred at Soči, is highly productive of fruit suitable for preparation of prunes. These have a 4% higher sugar content than Vengerka Ital'janskaja.

2139 Kuz'min, I. A.
(The plum in the south of Baškiria).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 48–49. [Russian].

Opata was the earliest, hardiest and most productive among the cherry plums tested. Novinka [Novelty] (*Prunus besseyi* x *P. ussuriensis*) and the variety Želtaja Hobty [Hobta's Yellow] of *P. ussuriensis* were also hardy and gave good crops.

2140 Kol'cova, E. V.
(The formation of economically valuable characters in hybrid plum seedlings).
Agrobiologija (Agrobiology) 1957 : No. 3 : 79–84. [Russian].

New hardy plums with high yield and fine quality of fruit have been bred at Mičurinsk. Most hybrids had the Mičurin variety Renklod Reforma [Reform Gage] as the pollen parent. The mother plants included Ternosliv Letnij [Summer Damson] and Tern Kistevoj [Bunch Sloe] from the Volga Basin, the central Russian variety Ternosliva [Damson] and the new variety 24/9. Hybrids from crosses between central Russian varieties were hardy but bore fruit of quality inferior to that of the hybrids first mentioned.

2141 Hansen, C. J., Lownsbery, B. F. & Hesse, C. O.
Nematode resistance in plums.
Calif. Agric. 1957 : **11** : No. 10 : 9, 13.

The resistance of several plum and peach rootstocks to *Meloidogyne incognita* var. *acrita* and *M. javanica* was determined in greenhouse trials. Marianna 2623 and 2624 and four strains of Myrobalan 29 are plum rootstocks which showed complete resistance to both nematodes. The peach seedlings S–37 and Shalil were resistant to *M. incognita* var. *acrita* but susceptible to *M. javanica*.

2142 Posnette, A. F. & Ellenberger, C. E.
Bark-split—a virus disease of plums.
Ann. appl. Biol. 1957 : **45** : 573–79.

Some resistant English scions and rootstocks are mentioned in an account of this virus disease.

2143 Smeets, L.
Some effects of temperature on the shoot growth of cherry seedlings.
Euphytica, Wageningen 1957 : **6** : 161–68.

Experiments are in progress at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, to determine the environmental factors governing growth and development of seedlings, in connexion with cherry breeding. Earlier investigations indicated that the duration of shoot growth of first-year seedlings, but not of second-year seedlings, may be affected by the photoperiod at a constant temperature of 20° C. [cf. XXVII, 1535 and 3416]. The present paper describes experiments on the effects of different combinations of day and night temperatures of 17°, 20°, 23° and 26° C. upon first- and second-year seedlings of *Prunus avium* 'Limburgse Boskriek' [Limburg Mazzard] under conditions of natural day length. Among seedlings of both ages, the various conditions of temperature mainly affected duration of growth.

2144 Freytag, H. E. & Blasse, W.
Zur Farbstoffausbildung einiger Süss- und Sauerkirschensorten. **(On the pigment formation of some sweet and sour cherry varieties).**
Arch. Gartenb. 1957 : **5** : 47–61.

Marked differences were found between some sweet and sour cherry varieties with respect to the development of anthocyanin pigments in the fruit; the absorption curves for the sour varieties had more pronounced maxima.

2145 Miščenko, O. N.
(The results of varietal trials of sour cherry).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 50–57. [Russian].

Ulučšennaja Ljubskaja [Improved Ljubskaja], Ljubskaja and Serednjačka [Middling] were the most productive of varieties tested in Voronež, though some others were as hardy as these. Širpotreb Černaja [Black Consumer's Demand] was distinguished by high quality of fruit.

2146 Cociu, V.
Un hibrid de perspectivă la piersic. **(A promising peach hybrid).**
Comun. Acad. Romîn. 1955 : **5** : 1497–502.

A promising F_1 hybrid has been obtained from the cross Chevreuse tardive (Late Chevreuse) x Amazona rubicunda. It combines the high yield and quality of the former parent with the resistance to frost, drought, *Taphrina deformans* and aphids of the latter.

2147 Kovalev, N. V.
(The propagation of the peach from stones).
Agrobiologija (Agrobiology) 1957 : No. 2 : 127–29. [Russian].

A number of varieties and hybrids which were found to give uniform sexual progenies under

Uzbek conditions are listed. The varieties comprise local forms, introductions such as Elberta and Valiant and new selections of peach and nectarine from the Institute of Plant Industry. Most have yellow flesh. Among the hybrids, Elberta x Zargaldak gives a progeny with yellow flesh and Ajdinovskij x Slava Tarnau [Tarnau Glory], Ajdinovskij x Zargaldak, Elberta x Slava Tarnau and Elberta x Ajdinovskij give white-fleshed progenies. The last mentioned hybrid is a clingstone form.

2148 **(The peach varieties Nakatsu White and Yamato Early).**
Nogyo oyobi Engei/Agric. & Hort. 1956 : **31** : p. 178. [Japanese].

The above two varieties have recently been registered. The first is a white-fleshed clingstone variety maturing in July and August. The second originated in a nursery of the variety Yamato White from which it differs by maturing in early July.

2149 **New peaches named.**
Amer. Nurserym. 1957 : **106** : No. 9 : p. 67.

Two yellow-fleshed, freestone selections developed at Rutgers University, NJ, have been named Goldgem and Summerqueen. Ripening at the same time as Sunhigh, Summerqueen has shown less susceptibility to bacterial spot. Goldgem is similar to Golden Jubilee in time of ripening.

2150 MORETTINI, A.
La "Gialla precoce Morettini". Incrocio —"J. H. Hale" x ("Lord Napier" x "Fior di Maggio"). [**Morettini's Gialla precoce. A cross of J. H. Hale x (Lord Napier x Fior di Maggio)**].
Riv. Ortoflorofruttic. ital. 1957 : **41** : 457–66.

MORETTINI, A.
La Gialla precoce Morettini. (**Morettini's Gialla precoce**).
Ital. agric. 1957 : **94** : 789–99.

The white flesh of the early parent Fior di Maggio [Mayflower] was dominant to the yellow flesh of J. H. Hale; however by crossing a hybrid of Lord Napier x Fior di Maggio with J. H. Hale three segregates were obtained which combined yellow flesh with the desired earliness, two of them ripening within 3–4 days of Cardinal and Early Rochester and within 1–2 days of Dixired. One segregate is distinguished by greater vigour and larger fruits and has given rise to the variety here described.

2151 KOMARNICKAJA, A. M. & ČERNOJAROV, M. V.
(An instance of change in the sexual organs of peach seedlings).
Agrobiologija (Agrobiology) 1957 : No. 4 : 153–54. [Russian].

Modifications of the flowers in two seedlings of the variety Avgustovskij [August] are reported from Kiev. The single flower so far produced by seedling 78 was female. Seedling 173 had an underdeveloped pistil with shortened styles.

2152 FOGLE, H. W., CARTER, G. H., INGALSBE, D. W. & NEUBERT, A. M.
Freestone peach varieties for the Pacific Northwest.
Bull. Wash. St. agric. Exp. Sta. 1957 : No. 576. Pp. 24.

Detailed information is provided on the fresh-fruit, canning and freezing qualities of a large number of varieties and on their adaptability to the irrigated region east of the Cascade Mountains. Early and late varieties are recommended for extending the peach season.

2153 SHAW, R. H. & DOLL, C. C.
Variation in minimum temperatures on a half-mile slope and their effect on peach trees.
Iowa St. Coll. J. Sci. 1957 : **32** : 63–69.

Of the selections tested in Iowa, A123 was found to be most resistant to low temperatures as shown by the number of blossoms setting fruit.

2154 TETEREV, F. K.
(Promoting the cultivation of peach towards the north by employing the mentor method).
Agrobiologija (Agrobiology) 1957 : No. **3** : 72–78. [Russian].

Mičurinist experiments on breeding outdoor varieties hardy under Leningrad conditions are described. The peach Pušistyj Rannij [Downy Early] from Jalta was grafted on *Prunus tomentosa*. The scion, on flowering for the second time, was fertilized by mixed pollen of various peach varieties + *P. tomentosa*. Fruits weighing 150 g. each and having as pleasant a flavour as those of Crimean or Caucasian peaches were obtained. A few fertile stones are being used to raise seedlings, which are expected to show improved hardiness.

2155 SURGULADZE, Š. M.
(An interesting instance of the origin of a species).
Agrobiologija (Agrobiology) 1957 : No. 4 : p. 154. [Russian].

A tree of *Citrus junos* produced two branches identified as *C. ichangensis*. They arose from a single somatic cell.

2156 CHIU, J.-C.
(Studies on *Phoma citricarpa*).
Nung-lin-hsueh Pao/J. agric. For. Taichung 1955 : **4** : 186–203. [Chinese].

Six isolates fell into one of two colonial types. The incidence of these on citrus varieties grown in Taiwan was determined by plating affected tissues on agar and classifying resultant colonies.

2157 LARUE, P.
Israël et le IVe Congrès de l'Agrumiculture Méditerranéenne. **(Israel and the IVth Congress on Mediterranean Citrus Cultivation).**
Tunis. agric. 1957 : **85** : 89–105.

This review includes remarks on the performance of some citrus varieties grown in Israel. The orange Shamouti frequently produces mutations; a Shamouti type was discovered which is later than Valentia [Valencia] and superior in taste. Some varieties of sweet orange appear to be resistant to tristeza and psorosis; some sour-orange varieties are also resistant to tristeza.

2158 MIWA, T.
(On pollination, fertilization phenomena and problems connected with fruit drop in the Hyuganatsu mandarin).
Miyazaki Daigaku Jiho (Shizenkagaku)/Bull. Miyazaki Univ. (Nat. Sci.) 1951 ; No. 2 : p. 2. [Japanese].

The Hyuganatsu [Hyuga Summer] mandarin is self sterile but cross fertile, as either male or female parent, with other *Citrus* varieties. Self fertility can be induced by bud or old-flower pollination or by treatment with naphthaleneacetic acid.

2159 WANG, H.
(Floral characteristics of the pomelo and varietal discrimination).
Nung-yeh Yen-chiu/Agric. Res., Taipei 1957 : **6** : No. 4 : 11–14. [Japanese].

The 31 varieties grown in Taiwan are differentiated on the basis of the pigmentation and pubescence of the floral organs.

2160 WATANABE, S., AOBA, T. & ABE, S.
(Studies on fruit setting in *Asimina triloba*. I. Observations on pollination and fertilization).
Yamagata Daigaku Kiyo (Nogaku)/Bull. Yamagata Univ. (Agric. Sci.) 1956 : **2** : 99–106. [Japanese].

The flowers are protogynous. The fruit set after selfing was 10–20%, after cross pollination, 30–50%.

2161 DARSHANA NAND
Size and shape of the terminal vegetative bud useful in classification of mango varieties.
Govt. agric. Coll. J., Kanpur 1957 : **16** : 152–56.

Sixteen varieties growing at the Government Agricultural College, Kanpur, have been classified on the basis of the size and shape of the terminal vegetative buds.

2162 TEXIER, J.
La noix de Grenoble a conquis une réputation mondiale. **(The Grenoble walnut has gained a world-wide reputation).**
Bull. tech. Ing. Serv. agric. 1957 : No. 122 : 449–62.

Brief illustrated descriptions are given of Mayette, Franquette and Parisienne, the only varieties to which the term Grenoble walnut is properly applicable. Rootstocks of *Juglans nigra* have shown resistance to root rot. *J. nigra* x *J. regia* hybrids were found to be vigorous but not completely fertile.

2163 KUZNECOV, I. V.
(The walnut in the Stavropol' territory).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. **6** : 57–59. [Russian].

Trojanovsky, Stavropol'skij Tonkokoryj [Stavropol' Thin-shelled], Stavropol'skij Ostronosyj [Stavropol' Pointed], Stavropol'skij Belyj [Stavropol' White], Podkumskij 3 and Profsojuznyj [Trade Union] have been selected from local material. They are hardy and productive of large thin-shelled nuts with high-quality kernels.

2164 PLICHET, F.
Le problème du noyer en Dordogne. **(The problem of the walnut tree in Dordogne).**
Rev. hort., Paris 1957 : **129** : 1,729–33.

At Clermont-Ferrand, a search for rootstocks resistant to *Phytophthora cambivora* and *Ph. cinnamomi* is in progress. It is thought that hybrids of *Juglans regia* with species such as *J. nigra* would combine resistance to *Phytophthora* with an adequate affinity for the scion varieties.

2165 ROMBERG, L. D.
Research work at U.S. Pecan Field Station, Brownwood, Texas.
Proc. Tex. Pecan Gr. Ass. 1957 : **36** : 33–34, 36–38, 40.

Procedures used in controlled pollination, vegetative propagation of the resulting seedlings and selection are described.

2166 DARPOUX, H., RIDÉ, M. & BONDOUX, P.
Le chancre du châtaignier causé par l'*Endothia parasitica*. (**Chestnut blight caused by *E. parasitica***).
Bull. tech. Ing. Serv. agric. 1957 : No. 123 : 491–515.

A brief summary of breeding for resistance to chestnut blight in Europe and America is included in this review. Some susceptible and resistant species of *Castanea*, *Castanopsis* and *Quercus* are mentioned.

2167 DARPOUX, H., RIDÉ, M. & BONDOUX, P.
Apparition de foyers d'"*Endothia parasitica*" sur châtaigniers en France. (**The appearance of colonies of *E. parasitica* on chestnut trees in France**).
CR Acad. Sci., Paris 1957 : **43** : 670–74.

It is suggested that Asiatic types of *Castanea mollissima* be used to produce hybrids resistant to *E. parasitica*. Differences in susceptibility to *E. parasitica* have also been found in *C. sativa* types. Attempts are being made to breed resistant trees at the Plant Breeding Station, Clermont Ferrand, and the Chestnut Station, Brive.

2168 DIONIGI, A.
Nuovi principi per la genetica del mandorlo. (**New principles for the genetics of the almond**).
Frutticoltura, Bologna 1957 : **19** : 477–85.

The aims and methods of almond breeding are discussed with reference to Western and Soviet genetic theories.

2169 SPINA, P.
Studio sulle principali cultivar di mandorlo in provincia di Siracusa. (**Study of the main cultivars of almond in the province of Syracuse**).
Riv. Ortoflorofruttic. ital. 1957 : **41** : 500–18.

Full descriptions and illustrations are given of the five almonds most widely grown in the Sicilian province of Syracuse.

2170 DEL GAUDIO, S.
Compilazione di una scheda amigdalografica. (**Compilation of a descriptive form for almonds**).
Frutticoltura, Bologna 1957 : **19** : 367–73.

A proposed scheme for uniform descriptions of the cultivars of almond is presented.

2171 VERMA, U. P. & PANDEY, S.
Dried litchi always has a good market.
Indian Fmg. 1957 : **7** : No. 6 : 6–7.

Five varieties were tested at the Agricultural Research Institute, Sabour. Bedana was found to be the sweetest and to have the best quality after dehydration.

2172 SPINA, P. & PENNISI, F.
La coltura del pistacchio in Sicilia. (**Pistachio growing in Sicily**).
Frutticoltura, Bologna 1957 : **19** : 533–57.

Descriptions are included of four varieties grown in Sicily.

2173 DE PRETER, E.
Les essais locaux d'arachides au sud du Congo belge 1942 à 1956. (**Local trials of groundnuts in the south of the Belgian Congo, 1942 to 1956**).
Bull. agric. Congo belge 1957 : **48** : 1103–19.

Illustrated descriptions and data on the pod and seed characters of the principal types of groundnut cultivated at the Experimental Station, Gandajika, are provided. The results of yield trials held during 1942–56 are reported; the Java type 1052 gave the best performance in several districts.

2174 RASSEL, A.
La culture de l'arachide sur les plateaux du Kwango. (**Groundnut cultivation on the plateaux of the Kwango**).
Bull. INÉAC 1957 : **6** : 301–11.

Of the many introductions tested at the Experimental Station, Kiyaka, A28 was found to be most promising; it is earlier and gives a higher yield than local runner varieties.

2175 SARKAR, S. K.
Male sterility in palms.
Agron. lusit. 1956 : **18** : 257–71.

Male sterility was studied in 28 species representing 23 genera. The frequency of meiotic irregularities ranged from 30·0% in *Rhapis flabelliformis* to 3·0% in *Dictyosperma album*. Percentage of deformed pollen grains varied from 20·0% in the latter species to 1·5% in *Cocos nucifera*, and percentage of empty grains from 6·0% in *Chrysalidocarpus lutescens* and *Caryota mitis* to 0·5% in *Sabal adansonii* and *Areca catechu*. Percentage of grains failing to germinate on an artificial medium was in general much higher than the total percentage of deformed and empty grains, and ranged from 45% in *Rh. flabelliformis* to 12% in *C. nucifera*.

Sterility is ascribed not only to meiotic irregularities but also to gene mutation and structural changes in the chromosomes. The lack of correspondence between the frequencies of meiotic irregularities and of empty and deformed grains is explained by assuming that the irregularities, as in the case of nondisjunction and lagging, do not necessarily result in such pollen. It is suggested that in general the vegetative mode of reproduction among the palms may be more important than the sexual and that fruit production may to a considerable extent be apomictic.

2176 SARKAR, S. K.
Sex chromosomes in palms.
Genet. iber. 1957 : **9** : 133–42.

A heteromorphic chromosome pair (AA_1) was observed in male plants in each of the three diecious species *Borassus flabellifer*, *Phoenix sylvestris* and *Ph. rupicola*, all with $2n = 36$, chromosome A being longer and occurring in female plants (AA). Unlike the other chromosomes, the heteromorphic pair formed no chiasmata during meiosis. It is suggested that the presence of only one pair of sex chromosomes in these putative allopolyploids may be accounted for by the development of diecism after the attainment of polyploidy.

2177 DOWSON, V. H. W.
Palm wine in Libya.
Trop. agriculture, Trin. 1957 : **34** : 295–309.

Of the varieties of date palm grown in Libya, Taabuuni and Limsi give the highest yields of sap suitable for wine making; the best sap comes from Bikraari.

2178 BALDINI, E.
Contributo allo studio delle cultivar Toscane di olivo. Indagini condotte in provincia di Pistoia. Parte II. (**Contribution to the study of olive varieties in Tuscany. Investigations conducted in the Pistoia province. II**).
Ann. Sper. agr. 1957 : **11** : No. 5 : Suppl. : il–lxxvi.

Detailed, illustrated descriptions are given of 20 olive varieties grown in this province and recommendations made for the choice of varieties [cf. 907].

Yearbook of the California Avocado Society 1957 : Pp. 168.

2179 *Report of the avocado variety committee, June 1957.* (*pp. 15–16*).

Varietal recommendations are made for different regions in California.

2180 *Cooper, W. C., Maxwell, N. & Otey, G. Cold hardiness and salt tolerance of avocado trees.* (*p. 97*). (*Abst.*).

In general, varieties of the Mexican race were poor in salt tolerance and superior in cold hardiness when tested in the Rio Grande Valley, Tex. Lula, a West Indian x Guatemalan hybrid, had a low degree of hardiness but a high degree of salt tolerance. A Mexican x West Indian hybrid, Arsola 1–18, showed the best combination of hardiness and salt tolerance.

2181 *Zentmyer, G. A. The search for resistant rootstocks in Latin America.* (*pp. 101–06*).

Information is given on collections of *Persea* spp. made in Central and South America and the West Indies during 1956 for possible use as rootstocks resistant to *Phytophthora cinnamomi*. According to preliminary tests, *P. caerulea*, *P. chrysophylla* and *P. alba* are highly resistant and *P. durifolia* from Peru and a *P. americana* collection from Colombia moderately so. The possibility of using the small-fruited species *P. caerulea* as a source of resistance in hybridization is mentioned. Data have not yet been obtained on the stock-scion compatibility of the collections with avocado.

2182 PHILIPPE, J.
Note sur la biologie florale de l'avocatier et choix des variétés à cultiver sur la base du groupe floral. (**A note on the floral biology of the avocado pear and selection of varieties for cultivation on the basis of the floral group**).
Bull. agric. Congo belge 1957 : **48** : 1155–62.

Varieties studied at Mvuazi fall into the following groups: (1) the stigma is receptive in the morning and the pollen is produced in the afternoon; and (2) the flower opens in the afternoon, when the stigma is receptive, and pollen is produced the following morning. Both types are necessary in an orchard to secure cross pollination. Varieties are recommended for cultivation in the Lower Congo region; these varieties are briefly described.

2183 HASKELL, G. M.
Breeding behaviour of subsexual *Rubus* species.
Heredity 1957 : **11** : p. 427. (Abst.)

This abstract gives a more detailed account of studies summarized earlier [XXVII, 3770].

2184 ROBERTSON, M.
Further investigations of flower-bud development in the genus *Rubus*.
J. hort. Sci. 1957 : **32** : 265–73.

The time of initiation and rate of development of the primary inflorescence have been examined in *R. idaeus* 'Lloyd George', *R. occidentalis* 'Cumberland', *R. occidentalis* x *R. idaeus* 'Malling 53/9', an East Malling loganberry clone, Himalayan Giant, Ashton Cross and a local wild blackberry.

2185 Medvedeva, O. A.
(The best raspberry and strawberry varieties in the province of Leningrad).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 54–56. [Russian].

Raspberry. Pavlovsk (English x Novost' Kuz'mina [Kuz'min's Novelty]) was bred at the Leningrad Horticultural Research Station. It is more productive than other hardy varieties tested and has large fruit of good flavour. Mention is made of other new hardy varieties with smaller fruit.
Strawberry. The new dessert varieties Slavjanskaja 5 [Slav 5], Krupnoplodnaja 41 [Large-fruited 41], Saharistaja 11 [Sugary 11] and a canning variety, Severnaja Urožajnaja 6 [Northern Productive 6], are described. All these are hardy and productive and have perfect flowers. The flavour is good.

2186 **New Midnite blackberry.**
Amer. Nurserym. 1957 : **106** : No. 9 : p. 66.

The above, introduced by Scarff's Nursery, New Carlisle, Ohio, is said to have high-quality, small-cored fruits larger than those of Eldorado and ripening over a comparatively long season. Developed from a wild selection, it has remained free from winter injury in Ohio and southern Michigan and so far has shown little of the sterility common among blackberry varieties.

2187 Dijksterhuis, H. P.
Verslag rode bessenrassenproefveld. **(Report on the red currant trial field).**
Tuinbouwber., Groningen 1958 : **13** : 2–3.

Results are presented showing the performance in 1956–57 of eight varieties in trials laid out in 1947 in Zeerijp, Netherlands.

2188 Lučnik, Z. I.
(On the occasion of the sixtieth birthday of M. A. Lisavenko).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : 61–62. [Russian].

This biographic note mentions briefly Lisavenko's breeding work with fruit trees and soft fruits in the Altaj, in particular black-currant varieties obtained by distant hybridization involving European and Asiatic forms.

2189 Bolotina, R. I.
(The black currant variety Baškirskij Velikan).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : p. 94. [Russian].

Baškirskij Velikan [Baškir Giant] was obtained by clonal selection from Černaja Kist' [Black Bunch]. It is a hardy midseason type producing on the average 2·85 kg. per bush with uniformly large berries.

2190 Vitkovskij, V. L.
(The black currant variety Primorskij Čempion in subarctic regions).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 56–57. [Russian].

Primorskij Čempion [Littoral Champion] grew well in long days at Hibiny, Murmansk province, and outyielded Igarka, a wild Siberian species acclimatized to the severe local climatic conditions.

2191 Zwarte bessenproeven. **(Black currant trials).**
Tuinbouwber., Groningen 1957 : **12** : 198–99, 201.

Information on the yearly and total yields, susceptibility to diseases and frost, flowering time and earliness of maturity is presented for seven varieties tested over 1948–56 at Zeerijp, Netherlands. Wellington XXX and Roodknop gave the highest yields.

2192 Stepanov, P. A.
(A spineless gooseberry).
Agrobiologija (Agrobiology) 1957 : No. 4 : p. 156. [Russian].

A spineless variety was obtained by continuous selection at Očer from hybrid material originating from Mičurinsk. The cross from which the seed was obtained is not specified but it is stated that a pollen mixture of some American varieties and the large-fruited variety Zelenyj Butyločnyj [Green Bottle] was employed. The new variety shows resistance to mildew.

2193 Belohonov, I. V.
(The achievements of Soviet science in horticulture).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 51–56. [Russian].

Mention is made of some recent gooseberry varieties: Russian, Pioneer, Severnyj Vinograd [Northern grape], Malachite, Desertnyj [Dessert], Ruby and Plodorodnyj [Prolific]. All these are distinguished by high yield, large fruit, good flavour and *Sphaerotheca* resistance.

2194 Burmistrov, A. D.
(A description of the cultivation of the gooseberry in the Latvian SSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 7 : p. 60. [Russian].

Mention is made of the Latvian-bred varieties 137 and Kuršu Dzintars [Amber Kuršu] which are distinguished by high yield, hardiness and resistance to *Sphaerotheca*.

2195 Egorov, V. I.
(Orchards in the Russian Federated Republic).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 22–26. [Russian].

A reference is made to new varieties of fruit trees and soft fruits interesting mainly for high quality and hardiness. Recent selections include the strawberry Komsomol, the average yield of which is 1·5 times higher than that of other varieties in central Russia.

2196 Suzuki, I.
(Problems concerning the varieties of strawberry in cultivation in the Tokai-Kinki region. I.).
Nogyo oyobi Engei/Agric. & Hort. 1956 : **31** : 51–54. [Japanese].

Varieties suitable for the above region are discussed. Using American varieties in the breeding programme, four new locally adapted varieties, Koshin 1–4, have been bred.

2197 Lebedev, P. M.
A hybrid between a cultivated and wild strawberry (variety Podmoskovnaja).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. **11** : p. 56. [Russian].

Podmoskovnaja [Suburban Moscow] ('Komsomol' x *Fragaria elatior*) from Saltykovskaja has perfect flowers and is productive of fruits which have a pleasant flavour and the aroma of a wild strawberry. The average yield per plant is 329 g. The first fruits weigh 36–42 g. each.

2198 Heggli, M.
Junigulsjuke (June yellows) på jordbær. **(June yellows of strawberries).**
Forskn. Fors. Landbr. 1957 : **8** : 369–75.

A series of crosses carried out at the Agricultural College of Norway indicated that, although Climax was the only parent with visible symptoms of June yellows, a tendency to the disease was transmitted also by Rubin and Ydun, both of which have the susceptible variety Howard 17 in their parentage, on the male side. Susceptible varieties grown in Norway are noted.

2199 Iacopini, P.
Contributo allo studio di alcune cultivar inglesi di fragola. **(Contribution to the study of some English cultivars of strawberry).**
Riv. Ortoflorofruttic. ital. 1957 : **41** : 487–99.

Among the varieties studied, Madame Lefebvre, Huxley 44 and Royal Sovereign were better than the Italian varieties in respect of quality and Huxley 44 and Cambridge 32 proved tolerant of lime and *Mycosphaerella fragariae*.

2200 Kedrova, O.
(The strawberry variety Kubanka).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : p. 96. [Russian].

Kubanka [strawberry from Kuban'] (Muto x Ananasnaja Krasnaja [Red Pineapple]) was bred at Krasnodar. It is a midseason variety productive of large fruits with aromatic flesh of pleasant flavour. It has perfect flowers and is resistant to drought.

2201 Il'inskij, A. A.
(New varieties of strawberry).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 7 : 54–55. [Russian].

Krasnodarskaja Rannjaja [Early Krasnodar] (Komsomol x Iosif Mahomet) and Desertnaja Kubani [Kuban' Dessert], obtained by open pollination of Ananas Belyj [White Pineapple] at Krasnodar, are described. Both are drought resistant and produce high-quality fruit with a strong aroma. Krasnodarskaja Rannjaja is the earlier of the two; the other variety has a high vitamin C content and is suitable for forcing without artificial light in winter.

2202 Barbier, R. & Cornuet, P.
La culture du fraisier. **(Cultivation of the strawberry).**
Bull. tech. Ing. Serv. agric. 1957 : No. 123 : 517–31.

Three wild European species, *Fragaria vesca*, *F. viridis* and *F. moschata*, are briefly described and the origin of cultivated forms from *F. virginiana* x *F. chiloensis* is mentioned. Strawberry cultivation is thought to date from the XIVth or XVth century. Eight European varieties which are considered worth recommending for their yield, quality and earliness are described; virus-free stocks of these have been obtained at the Plant Breeding Station, Versailles.

2203 Sahlström, H.
Sortförsök med jordgubbar, 1950–1956. **(Varietal trials of strawberries, 1950-56).**
Medd. Trädgårdsförs. 1957 : No. 109 : Pp. 28.

Sahlström, H.
Jordgubbssorter. (**Strawberry varieties**).
Försök o. Forskn. 1957 : **14** : 94–95.

In trials of 31 varieties, carried out in seven areas in Sweden, Möja and Abundance were among those most resistant to *Botrytis* fruit rot; Ydun was the highest cropper in most trials but was only moderate in quality and Macherauchs Frühernte [Macherauch's Early Harvest] and Valentine ripened earliest.

2204 van den Brande, K.
Ervaringen met aardbeirassen op zandgrond. (**Experiences with strawberry varieties on sandy soil**).
Tuinbouwber., Leuven 1957 : **21** : 227–28.

Information on the earliness, yield and suitability for different kinds of processing is presented for 18 varieties tested in the Netherlands.

2205 Shepherd, K.
Banana cultivars in East Africa.
Trop. agriculture, Trin. 1957 : **34** : 277–86.

East African clones were grown and compared with the standard collection at the Imperial College of Tropical Agriculture, Trinidad. Brief descriptions of the East African cultivars are given and their origin from *Musa acuminata* or *M. balbisiana* is mentioned.

2206 Simmonds, N. W.
Wild bananas in Malaya.
Malay. Nature J. 1955 : **10** : Pp. 8.

Four species are described and keys are provided for the identification of these species and the Malayan forms of *Musa acuminata*. Edible varieties have evolved from *M. acuminata* and *M. balbisiana*; they are diploid or triploid and the latter never produce fertile pollen. Some interspecific hybrids are listed.

2207 Hseu [Hsu], C.-C.
(**Report on investigations on strains of the Cayenne pineapple**).
Chung hua Nung hsueh Hui Pao/J. agric. Ass. China 1957 : No. 18 : 47–58. [Chinese].

Bud mutation has led to considerable variation in Taiwan material of the Cayenne type. Six clones have been selected for comparative study and these are classified into three groups on the basis of yielding capacity and plant characters.

VIIIe Congrès International de la Vigne et du Vin, Santiago du Chili. (**VIIIth International Congress on vines and wines, Santiago, Chile**).
Bull. Off. int. Vin 1955–1957 : **28–30.**

The first section of this conference deals with rootstock varieties. A general report is included, in which breeding methods are discussed and the national reports (see below) are summarized. Historical accounts of viticulture during the XXth century are included in most of the national reports.

2208 *Cuende, F. J. Rapport général.* (*General report*). (*No. 304: pp. 15–59*).

Of the varieties tested at Meknès in Morocco 41B and R99 have proved most satisfactory; R99 appears to be more vigorous than 41B and is resistant to drought.
Mcvani x Riparia I, Mcvani x Riparia II, Rkaciteli 14, and Mcvani x (Berlandieri x Riparia 420A) 32 are some of the new varieties which have been produced in Georgia, USSR, by crossing local vines with standard rootstocks. The current aim is to breed varieties on which grafting will not be necessary.
In Turkey, R99 and 110 have been found most satisfactory for dry regions and 41B for calcareous soils; clone 106–8 has done well on clay soils and 420A has proved resistant to high temperature.

2209 *Dalmasso, G. Lutte contre le* Phylloxera (*à l'exclusion de l'emploi des porte-greffes résistants*). *Rapport général* (*pour l'Europe*). [*The control of* Phylloxera *excluding the use of resistant rootstocks. General report* (*for Europe*)]. (*No. 308: pp. 5–30*).

Some varieties of *V. vinifera* which have been found resistant to *Phylloxera* are mentioned.

2210 *Oliveira, A. B. de. Lutte contre certaines maladies cryptogamiques de la vigne. Rapport général.* (*The control of certain cryptogamic diseases of the vine. General report*). (*No. 309: pp. 14–29*).

Lists are provided of vines which have shown resistance to *Oidium tuckeri* in America, Europe and Africa.

2211 *Terami, H. Japon.* (*Japan*). (*No. 311: pp. 59–61*).

A brief history of Japanese viticulture is given. *Vitis vinifera* 'Koshu' has been cultivated for 800 years. American introductions have done well; new varieties such as Neo Muscat [New

Muscat] (Sanjaku x Muscat d'Alexandrie) and Muscat Bailey A (Bailey x Muscat Hambourg) have proved well adapted to the Japanese climate.

2212 *Algérie.* (*Algeria*). (*No. 313: pp. 41–56*).
Reports are presented on the performance of the principal varieties used during the XXth century; data are included on suitability for grafting, resistance to *Phylloxera* and tolerance of a high Na or Ca content in the soil.

2213 *Husfeld, B.* *Allemagne.* (*Germany*). (*No. 314: pp. 5–6*).
For breeding varieties adapted to German environments, the author recommends using wild types of *Vitis* and interspecific hybrids.

2214 *Zuluaga, P. A.* *Argentine.* (*Argentina*). (*No. 314: pp. 6–34*).
Data are provided on the yield from a large number of rootstock-scion combinations tested at four centres. *Vitis rupestris* 'du Lot' gave the best performance on dry, infertile soil. A number of American hybrids such as 16–16 and 216–3 did well on damp soil; on P-deficient soil the *V. berlandieri* x *V. riparia* crosses 34EM and K5BB were most promising and on fairly good soil the hybrid 106–8 gave a particularly high yield.

2215 *Autriche.* (*Austria*). (*No. 315: pp. 8–12*).
Varieties are recommended for wine making and for dessert. Rootstocks resistant to drought and heat are listed; the Berl. x Rip. crosses 5BB, 5C and 8B and Chasselas x Berl.41B have been found resistant to both these factors. The influence of some rootstocks on the performance of the scion is discussed.

2216 *Trueba, D. J. & Hidalgo, D. L.* *Espagne.* (*Spain*). (*No. 315: pp. 13–26*).
Bobadilla, G. F. de. *Espagne.* (*Spain*). (*No. 316: pp. 6–11*).
A brief history of breeding in Spain is given and the adaptability of a number of rootstocks to different environments is recorded. Data on the performance of rootstocks tested at Jerez are provided in a separate report. Hybrid 161–49 from Couderc (Riparia x Berlandieri) has done well in soils with high Ca content and is resistant to drought and heat; Berlandieri 13–5 and Berlandieri Colombard 1 Blanchard gave good performances on dry limy soil at Jerez. Stock 41B from Millardet (Chasselas x Berlandieri) has been found suitable for most districts. Of the new hybrids being tested, 333 École [School 333] and 157–11 appear to be suitable for calcareous soils. At Haro the influence of different rootstocks on the length of life of the scion is being studied. Rootstocks with a satisfactory affinity for some widely-used scions are listed.

2217 *Galet, M. P.* *France.* (*No. 316: pp. 12–32*).
Data are provided on the vegetative cycle of a large number of rootstocks; this information is used in determining which varieties are suitable for grafts with the scions in common use. The performance of some species and hybrids in France is described. 1616 Couderc and 216–3 Castel are recommended for saline soils; 33EM and 41B are considered suitable for calcareous soils. Several varieties including 110 Richter and 44–53 Malègue have shown satisfactory resistance to drought.

2218 *Vlahopoulos, P.* *Grèce.* (*Greece*). (*No. 316: pp. 32–49*).
The varieties 41B, R110, R99 and 42DA and Rupestris du Lot are recommended for cultivation in Greece; all these have been found resistant to drought and tolerant of a high Ca content in the soil.

2219 *Cosmo, I.* *Italie.* (*Italy*). (*No. 317: pp. 7–21*).
The principal rootstocks used in Italy are discussed; the following are considered resistant to drought and tolerant of chlorotic soils: 140 Ruggeri, 779 Paulsen and 420 A. Kober 5BB, 225 Ruggeri and some recent selections from Teleki 8 are tolerant of damp conditions and 1103 Paulsen is resistant to soil salinity.

2220 *Baptista, A. & Suspiro, E.* *Portugal.* (*No. 318: pp. 4–44*).
The results are reported of varietal trials held in the principal vine-growing districts.

2221 *Negroul, A.* [*Negrul', A. M.*] *U.R.S.S.* *La vigne euro-asiatique en tant que matériel servant de point de départ à la sélection.* (*Russia. The Euro-Asiatic vine as material serving as a starting point for selection*). (*No. 318: pp. 44–55*).
Ancient varieties of vine from the Basin of the Black Sea and others of east European and Oriental origin are described and their value for breeding new varieties is discussed. Crosses between varieties of different geographical origin have produced some promising hybrids.

2222 *Turkovic, Z.* *Yougoslavie.* (*Yugoslavia*). (*No. 318: pp. 64–66*).
Notes are provided on the principal rootstocks in use, with special reference to their soil requirements.

XXXVIe Session Plénière Officielle du Comité de l'O.I.V. Situation des travaux d'amélioration de la vigne et de sa culture. **(XXXVIth Full Official Session of the Committee of the International Wine Bureau. The state of research on the improvement of the vine and its cultivation).**
Bull. Off. int. Vin 1956–1957 : **29** and **30.**

The following reports were presented at the above conference held at Mendoza, Argentina in April 1956.

2223 *Zuluaga, A. Rapport général (pour l'Amérique du Sud). [General report (for South America)]. (No. 310: pp. 35–42).*

At Mendoza dessert varieties of *V. vinifera* were crossed with Sultana types; of the 17 seedless hybrids obtained, 13A and 43 are parthenocarpic. Diploid varieties are being crossed with tetraploids of Sultanina Gigas in order to produce triploids with few seeds. A Malbeck tetraploid was obtained by means of colchicine treatment. Salt Creek was crossed with 1616 and 1613; it is hoped that hybrids resistant to nematodes and *Phylloxera* will be produced. Work has begun on inducing heterosis by means of successive self fertilisation followed by hybridisation of the best clones.
At Junín attempts are being made to incorporate a muscat flavour into the variety Ohanes.
In a separate account from Argentina, further details of polyploid breeding are given.

2224 *Husfeld, B. Allemagne. (Germany). (No. 310: pp. 43–44).*

A brief review is presented of breeding in Germany. By crossing European varieties with wild types and then back crossing with the *V. vinifera* parent, hybrids were obtained which surpass the European varieties in yield and resistance to common pathogens.

2225 *Cosmo, I. Italie. (Italy). (No. 312: pp. 53–58).*

A review is presented of vine breeding in Italy during the XXth century.

2226 *Almeida, J. L. F. de & Coutinho, M. P. Portugal. (No. 312: pp. 59–61).*

The aims and methods of vine improvement in current use are briefly reviewed.

2227 A Szőlészeti Kutató Intézet, Budapest. **(The Viticultural Research Institute, Budapest).**
KisérlÜgy. Közl. 1956 : **50** : 320–32.

The main lines of research at the above institute are recorded and include clonal selection and hybridization.

2228 Loladze, V. R.
(Somatic variability of the vine and the fixing of changed characters in the progeny).
Agrobiologija (Agrobiology) 1957 : No. 2 : 120–23. [Russian].

Forms of Mcvane, Rkaciteli and Saperavi found in Georgia differed from the types in the shape of leaves or bunches, or in the colour and size of the berries. All these variants, except a form of Mcvane with a compound leaf and another with large berries and small bunches, reverted to type.

2229 Registre ampélographique international. **(International ampelographic register).**
Bull. Off. int. Vin 1956 : **29** : No. 309 : Pp. 11 + 9; 1957 : **30** : No. 311 : Pp. 6 + 6; No. 312 : Pp. 6; No. 313 : Pp. 6 + 6 + 6; No. 314 : Pp. 5 + 5 + 5 + 6 + 7; No. 315 : Pp. 4 + 4 + 4; No. 316 : Pp. 5 + 6 + 4 + 4 + 4 + 4 + 4; No. 317 : Pp. 5 + 5 + 4 + 5.

Full illustrated descriptions of the following varieties are provided: Riesling Italico [Italian Riesling], Tocai Friulano [Friuli Tokai], Raboso Piave, Raboso Veronese, Pinella, 00510 Cinsaut, Ahmeur Bou Ahmeur, El Gouz [Walnut], Hadari, Farana, Maticha, Verdicchio Bianco [White Verdicchio], 073501 Dabouki, 0049 03 Aubun, 000801 Oeillade Noire [Black Glance], Garganega, Nuragus, 0052 01 Brun Argenté [0052 01 Silvery Brown], 9031 161–49 Couderc, 0012 01 Piquepoul Gris [0012 01 Grey Piquepoul], 0051 05 Bourboulenc, 0009 01 Morrastel, Geisenheim 26, 015002 Syrah, 001501 Terret Gris [Grey Terret] and 007201 Mourvaison.

2230 Cosmo, I., Comuzzi, A. & Savian, A.
Indagini sulla ricostituzione viticola in provincia di Venezia. Primo contributo. Zona del Livenza e Tagliamento. Secondo contributo. Zona del Piave. Terzo contributo. Zona del Brenta-Dese. **(Studies on the reconstitution of the vineyards in the province of Venice. I. Livenza and Tagliamento Zone. II. Piave Zone. III. Brenta-Dese Zone).**
Ann. Sper. agr. 1957 : **11** : 317–60; 1419–74.

The results obtained in the experimental vineyards of the Conegliano viticultural research station in each of the above regions are discussed. As in previous studies [cf. XXV, 40 and XXVI, 697, 1792–4 and 3786], details are given of the performance of a number of varieties, on different rootstocks, observed over a period of several years. Varieties and rootstocks showing the best adaptation in each zone are listed.

2231 Cosmo, I. & Polsinelli, M.
"Verdiso".
Ann. Sper. agr. 1957 : **11** : No. 5 : Suppl. : lxxxvii–xcvi.

The characteristics of this grape variety are described. It bears greenish-yellow fruit used for wine making and also to a certain extent for direct consumption.

2232 Fernández de Bobadilla, G.
Viníferas jerezanas y de Andalucía occidental. **(Vines of Jerez and eastern Andalusia).**
Inst. Nac. Invest. Agron., Madrid 1956 : Pp. 271.

Full ampelographic descriptions are given of the classical vine varieties used in the preparation of the typical (sherry) wines of the region and of a number of others that are of lesser quality or grown for special purposes or for dessert.

2233 Leyvraz, H.
La production des raisins de table en Suisse Romande. **(The production of dessert grapes in French-speaking Switzerland).**
Landw. Jb. Schweiz 1957 : **71** : 785–800.

The principal characters are mentioned of a series of white, red and black grape varieties, which are recommended for this part of Switzerland.

2234 Constantinescu, G. & Negreanu, E.
Hibrizi noi de perspectivă pentru viticultura din R.P.R. **(Promising new hybrids for viticulture in the Rumanian People's Republic).**
Bul. şti. Secţ. Biol. Şti. agric.: Ser. Agron.: 1957 : **9** : 5–17.

The following new hybrids are described: (1) dessert grapes, 1/2/7, a seedling of Bican*, an early black variety with normal flowers; 1/2/24, of similar origin to the preceding, a black variety with normal flowers, earlier and with a higher sugar content than the mother plant; 1/3/8, a seedling of Coarnă neagră [Black Coarnă], a white variety with muscat flavour; 1/3/10, another seedling of Coarnă neagră, earlier than the mother plant; 7/1/13, of similar origin to the preceding, earlier than the mother plant, with more sugar and a muscat flavour; 7/8/33, a seedling of Tîţa vacii [Cow's Udder], improved resistance to *Botrytis cinerea*; 7/1/38, a seedling of Ceaus alb [White Courier], resistant to frost; 5/3/5 (Tîţa vacii x Seibel 7603), high sugar content; 6/12/10 (Coarnă neagră x Afuz-Ali roz [Pink Afuz-Ali], black elongate berries; 2/13/22, a seedling of Coarnă neagră, deep black berries; 2/12/14 (Bican x Afuz-Ali), pink berries; 2/13/8, a seedling of Bican, berries larger than in the mother plant; 3/1/3 (Bican x Regina viilor [Queen of the Vineyards]), elongate berries; 3/4/25 (Coada vulpii x Hamburg Muscat), large elongate berries; 3/5/17 (Coada vulpii x Busuioaca roză de Moldova [Pink Busuioaca from Moldova†]), large white berries; 2/13/17 (Regina viilor x Hamburg Muscat), black oval berries; 2/10/1 (Crîmpoşie x mixed pollen), hermaphrodite flowers and large berries; 4/3/9 (Băşicată x mixed pollen), early, aromatic flavour; (2) vintage grapes, 7/10/11, a seedling of Aligoté, muscat flavour, 8/14/5; Hamburg Muscat x Pinot noir [Black Pinot], muscat flavour and high sugar content; 6/5/7, a seedling of Labrusca B, nonfoxy flavour and resistant to mildew; 3/3/1, Negru vîrtos x Bătută neagră [Black Bătută], hermaphrodite, coloured must; 2/2/23 (Negru vîrtos x mixed pollen), high sugar content and elongate berries; 2/5/26 (Saperavi x mixed pollen), hermaphrodite flowers and coloured must; 2/9/7 (Seibel 6339 x mixed pollen), muscat flavour; 2/11/14 (Coada vulpii x Busuioacă roză de Moldova†), black berries and coloured must; 9/16/43, a seedling of Seibel 6720, black nonfoxy berries; and (3) rootstocks, 9/30/10 [Tigvoasa x (Berlandieri x Riparia Teleki 8B)], resistant to mildew and frost.

2235 Šapkin, Ju. D.
(Viticulture in Turkmenistan).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 11 : 47–50. [Russian].

A few high-quality land varieties of vine from Turkmenia are mentioned. They include some fine wine varieties such as Terbaš, the dessert variety Nukurskij Krupnyj [Large Nukurskij], distinguished by its pleasant flavour, and the high-quality sultana Kišmiš Krasnyj Turkmenskij [Red Turkmenian Sultana].

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* = Bicane.

† In the second reference to this variety it is cited as equivalent to Muscat Frontignan rouge [Red Frontignan Muscat].

2236 FURUSATO, K., ISHIBASHI, K. & OHTA [OTA], Y.
(On tetraploid grape varieties).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 105–07. [Japanese].

The preliminary report of these investigations has been summarized already [XXVII, 3826].

2237 GARGIULO, A.
Mutación espontánea tetraploide en Barbera D'Asti. **(A spontaneous tetraploid mutation in Barbera D'Asti).**
Vitis 1957 : **1** : 156–58.

This tetraploid was found at the National University of Cuyo, Argentina; it is reported to give a good yield of grapes which are twice the size of those from the diploid.

2238 ALLEY, C. J.
Cytogenetics of *Vitis*. II. Chromosome behavior and the fertility of some autotetraploid derivatives of *Vitis vinifera* L.
J. Hered. 1957 : **48** : 195–202.

Diploid and autotetraploid clones of Cornichon, Folle blanche [White Fool], and Zinfandes were studied. The degree of self fertility of the autotetraploids was found to resemble that of the corresponding diploid variety. Amongst inbred tetraploid seedlings and in the F_1 hybrids from two tetraploid varieties, individuals were found with either higher or lower self fertility than the parents; the hybrids were more self fertile than the inbreds. Pollen from diploid varieties showed a higher germination percentage than that from the derived tetraploids. Ovule fertility was found to be correlated with self fertility but not with pollen fertility. When the tetraploid was used as the pollen parent more defective seeds were obtained than when it was used as the seed parent. Chromosome behaviour in the above varieties and in some tetraploid crosses is described. It is thought that the behaviour of aberrant chromosomes during meiosis is less important in determining the fertility of autotetraploids than factors such as the segregation of genes.

2239 MANARESI, A. & CAPUCCI, C.
La fertilità dei polloni nella *Vitis vinifera*. **(The fertility of basal shoots in *V. vinifera*).**
Riv. Vitic. 1957 : **10** : 71–81.

Tabulated data are included showing the number of basal shoots produced, after frost damage, by 24 grape varieties in a number of localities in Italy and the number of these shoots bearing fruit. The best recovery from damage was shown by Moscatellone, in which 84% of the shoots bore fruit.

2240 HOFMANN, E. L.
Die Histologie der Nodositäten verschiedener Rebensorten bei Reblausbefall. **(The histology of the galls of different grape varieties after attack by *Phylloxera*).**
Vitis 1957 : **1** : 125–41.

The greater tolerance towards *Phylloxera* of American *Vitis* species compared with that of *V. vinifera* was found to be associated with factors such as more rapid root development and early thickening of the endodermis; the latter protects the central root cylinder from injurious substances released in the region of attack.

2241 KLINGLER, J.
Vorläufige Mitteilung über Unterschiede zwischen wurzelechten Europäerreben und Unterlagenreben in bezug auf Befall und Schaden durch den Gefurchten Dickmaulrüssler, *Otiorhynchus sulcatus* F. **(A preliminary note on the difference between ungrafted European grapes and grafted grapes with respect to attack and damage by *O. sulcatus* F.).**
Schweiz. Z. Obst- u. Weinb. 1957 : **66** : 513–16, 538–40.

Tests have indicated that grafted vines are considerably more resistant than ungrafted vines to *O. sulcatus*; some of the rootstocks tested are thought to be Riparia x Rupestris hybrids.

2242 ANDERS, F.
Neuere Auffassungen über die Reblaus-Resistenz. **(New conceptions of *Phylloxera* resistance).**
Vitis 1957 : **1** : 142–52.

Hosts such as some American varieties of *Vitis rupestris* responded to *Phylloxera* attack by producing large galls in which the cells remained healthy; these varieties suffered little damage from *Phylloxera*. In some *V. vinifera* varieties, the galls were small and soon became infected with microorganisms; this infection spread to other parts of the plant causing considerable damage. It is suggested that genotypes be selected for their ability to form healthy galls; this capacity is associated with a high frequency of mitosis.

2243 LAZAREVSKIJ, M. A.
(Vine varieties for the irrigated zone of the Don-Cimljansk hydropower unit).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. **3** : 56–62. [Russian].

Many varieties have been tested at the RSFSR

Institute of Viticulture and Wine Making and are recommended for cultivation under irrigation or rainfed conditions in the Don Basin. The dessert varieties include a recent selection of the Central Asiatic Branch of the Institute of Plant Industry, Muskat Uzbekistanskij [Uzbekistan Muscat], distinguished by high yield and quality and good transportability.

2244 ALLEWELDT, G.
Der Einfluss von Photoperiode und Temperatur auf Wachstum und Entwicklung von Holzpflanzen unter besonderer Berücksichtigung der Gattung Vitis. **(The influence of photoperiod and temperature on growth and development of woody plants with special reference to the genus *Vitis*).**
Vitis 1957 : **1** : 159–80.

Some intervarietal and interspecific differences in the effect of photoperiod and temperature on the development of *Vitis* are mentioned in this review.

FORESTRY

Berichte über die 5. Tagung der Arbeitsgemeinschaft für Forstgenetik und Forstpflanzenzüchtung vom 6. bis 8. August 1956 in Berlin. **(Reports on the 5th meeting of the Association for Forest Genetics and Forest Tree Breeding, from 6 to 8 August 1956 in Berlin).**
Silv. genet. 1957 : **6** : 148–56.

Papers presented at the above meeting include the following:—

2245 *Bolland, G. Untersuchungen über den Drehwuchs an Kiefernmutterbäumen und ihren Nachkommenschaften. (Investigations on spiral growth in mother trees of pine and their progeny). (pp. 150–51).*

The degree and direction of spiral growth in young trees gave no information on the mature phenotype, but in studies of the 30 to 32 year old progeny of a number of mother trees evidence of the heritability of the direction and to some extent the degree of spiral growth was obtained. It is recommended that trees with spiral grain should not be used in grafts for seed production.

2246 *Gerhard, H. Inwiefern ist die Wuchsform der Waldbäume im atlantischen Klimakeil erblich, inwiefern durch Umweltsfaktoren bedingt? (To what extent is the growth form of forest trees in the Atlantic climatic zone heritable and to what extent conditioned by environmental factors?) (p. 151).*

Although *Populus canescens* in the Schleswig forest district appears to consist of one clone, since all the trees are male, resemble each other in flower characters and can be traced to material introduced 300 years ago, marked variations in form corresponding to edaphic and climatic differences are found throughout the region. It is concluded that other sexually propagated, broad-leaved trees are liable to similar environmentally conditioned variation. It is therefore suggested that, for planting in favourable localities, the best trees from poor surroundings are likely to be of greater genetical value than those from a favourable environment.

2247 *Günther, H. Gebirgspappeln. (Mountain poplars). (p. 151).*

Forms of *Populus trichocarpa* and *P. tacamahaca* showing good growth together with resistance to snow damage and frost have been found in the Erz mountains at altitudes up to 900 m. and are being tested for suitability for mountain planting.

2248 *Illies, Z. M. Zytologische Beobachtungen an einer 7 jährigen C_0-Generation von Lärche. (Cytological observations on a 7-year-old C_0 generation of larch). (pp. 151–52).*

In chromosome studies of young needles of a mixoploid plant induced by colchicine treatment in 1950, shoots of normal diploid appearance had chromosome numbers of $2n = 24$, 30 and 48 while in the shoots which were mixoploid in appearance the numbers $2n = 24$, 36 and 45 were found. Chromosome counts in other tissues of mixoploid plants showed almost all aneuploid numbers from the diploid to tetraploid condition to be present. Sectors or tissues with a uniform chromosome number throughout were rarely found. The high degree of mixoploidy was retained in grafts and was associated with the formation of multipolar spindles at anaphase. Pollen, produced for the first time in 1956, showed regular pollen grain mitosis with $n = 18$, the normal haploid number being $n = 12$.

2249 *Joachim, H. F. Über die Spreewaldpappel. (On the Spreewald poplar). (p. 152).*

A black poplar hybrid occurring in the Spreewald, Eastern Germany, is characterized by excellent growth and low susceptibility to pests.

2250 *Langner, W. Selbstfertilität bei* Picea omorica. *(Self fertility in* P. omorica*). (pp. 152–53).*

The percentage of full seeds produced after self pollination in each of two trees was appreciably higher than after crossing with pollen from other trees. In one of the trees the proportion of seedlings obtained from the full selfed seeds was greater than from the full crossed seeds, while in the other the proportions were similar. It is suggested that the self fertility and high degree of uniformity found in this species in its small area of distribution results from former selection in favour of genotypes lacking gene groups for reducing fertility together with isolation and inbreeding over many generations.

2251 *Meyer, H. Über einige Ergebnisse der Blasenrost-Resistenzzüchtung. (On some results of breeding for resistance to blister rust). (p. 153).*

Crosses among apparently healthy *Pinus strobus* plants selected from an infected environment gave seedlings which did not differ significantly in incidence of attack by *Cronartium ribicola* from unselected plants of eight clones obtained by grafting scions of the parents on to healthy stocks; three have so far proved susceptible. In view of these unsatisfactory results, interspecific crosses are now being attempted, of which the most promising, *P. strobus* x *P. griffithii*, now in its third year, has so far not succumbed to artificial infection. *P. strobus* x *P. monticola* and *P. monticola* x *P. flexilis* have proved highly susceptible while attempts to cross *P. strobus* and the resistant species *P. peuce* have been unsuccessful.

2252 *Neugebauer, W. Unterschiedliche Frostschäden bei Douglasien-Sämlingen. (Differences in frost damage in Douglas fir seedlings). (pp. 153–54).*

In a seedling plantation in West Germany, comprising individuals from four different localities in Germany and four in the USA, the only trees not severely damaged by frost in the winter of 1955/56 were those from two of the American stations. One of the resistant forms was from a high altitude and was of the *caesia* type while the other, a lowland coastal form, was of the *viridis* type.

2253 *Schmucker, T. Reziproke Pfropfungen mit früh- und spättreibenden Rassen. (Reciprocal grafts of early and late flushing races). (p. 154).*

In reciprocal grafts of the above type in both *Picea excelsa* and *Fagus sylvatica*, the stocks and scions continued to flush at the date characteristic of the trees from which they originated.

2254 *Schönbach, H. Die Züchtung frostharter Douglasien. (Breeding frost-hardy Douglas firs). (pp. 154–55).*

In the course of work on the production of frost-hardy trees with the high yield of the *viridis* type, it was found that progenies of 30 trees thought to be of *viridis* origin fell into two groups, hardy and susceptible, year-old seedlings of the former having the dark green colour and free terminal bud of the *caesia* type and the latter the lighter colour and terminal buds covered with needles characteristic of the *viridis* form. The mother trees of the two groups did not differ in yield. By their eighth year, seedlings of each group had lost their morphological uniformity and showed wide variation in form.

2255 *Schröck, O. Beobachtungen an der Nachkommenschaft einer Zapfensuchtkiefer. (Observations on the progeny of a pine showing abnormally high cone production). (p. 155).*

A pine characterized by the above disorder and a tendency to fork produced open-pollinated progeny showing both these characters together with early bearing and a tendency to produce adventitious shoots. In vitality, plant height, cone shape and size, fertility and seed germination, the progeny was exceptionally variable. Seedlings with abnormal cone production flowered sooner than normal trees. The observations indicate that the cone disorder is heritable and that selfing has occurred, allowing the expression of genes controlling various defects. It is suggested that, in breeding pines, mother trees should be tested not only for combining ability but also for the presence of undesirable recessive genes.

2256 *Schütt, P. Bisherige Resultate der Auslese schütteresistenter Kiefern in Nordwestdeutschland. (Results up to date of selection of leaf-cast resistant pines in north-western Germany). (p. 155).*

In selecting for resistance in severely infected areas over a period of five years, it has been found that unattacked trees are absent and resistant trees rare. The resistant selections are propagated by grafting and subjected to artificial infection.

2257 *Seitz, F. W. Graupappelkreuzungen. (Grey poplar crosses). (p. 155).*

The respective progenies produced by crossing a single mother tree with four different male parents in 1955 showed distinct differences in growth in height but were otherwise highly uniform, while the open-pollinated progeny of a mother tree from the same stand contained aspen-like individuals closely resembling artificial hybrid seedlings from the cross *Populus tremula* x *P. canescens*.

2258 *Stern, K. Über die Regression des Samengewichtes zur Keimpflanzengrösse bei der Fichte. (On the regression of seed weight on plant size in spruce). (pp. 155–56).*

Regression curves of seed weight against length of the hypocotyl after three weeks are presented for spruces from stands in Schleswig-Holstein and the Erzgebirge. The two provenances did not give significantly different regression coefficients but they showed a highly significant difference in mean plant size. The material from Schleswig-Holstein was appreciably more variable than that from the Erzgebirge.

Tagung für Forstpflanzenzüchtung. (**Meeting on forest tree breeding**). Silv. genet. 1957 : **6** : 157–62.

Among the papers read at the above meeting, held on 27–28 June 1956 at the Wächtersbach Institute of Forest Genetics and Forest Tree Breeding, Germany, were the following:—

2259 *Heitmüller, H.-H. Experimentelle Untersuchungen zur Klonprüfung bei Waldbäumen. (Experimental investigations on clonal testing of forest trees). (pp. 157–58).*

The following difficulties involved in conducting reliable clonal tests are noted. The growth intensity of a clone is lower the greater the age of the mother tree and also depends on the order of branching and the tree height from which the clonal material is taken. There is some doubt as to whether a tree grown from a cutting will produce wood of the same quality as that of the mother tree. Lastly, there may be some rootstock effects where grafted trees rather than cuttings are used. These problems are currently under investigation at Wächtersbach.

2260 *Heitmüller, H.-H. Die Selbstungsanalyse als Möglichkeit der Kombinationsprüfung bei Kreuzungen innerhalb der Gattung* Alnus. *(The analysis of selfings as a possible means of testing combinations in crosses within the genus* Alnus*). (pp. 158–59).*

The mean height of the hybrid progeny of two trees of *A. incana* agreed closely with the calculated mean of the heights of the progenies resulting from selfing of the parents. The same was true of selfed and interspecific hybrid progenies of *A. incana* and *A. glutinosa*, selfed *A. incana* being taller than selfed *A. glutinosa.*

2261 *Heitmüller, H.-H. Kreuzungsarbeiten in Gewächshäusern. (Hybridization work in greenhouses). (p. 159).*

At Wächtersbach the use of greenhouses with isolation chambers in crossing alders has removed the need for bagging and, since grafted plants are employed, allows greater control of flowering time in the parents than is possible with trees growing in the open.

2262 *Heitmüller, H.-H. Untersuchungen über die Förderung der Blüten- und Samenbildung bei Waldbäumen. (Investigations on the promotion of flower and seed development in forest trees). (p. 159).*

In an attempt to hasten the onset of flowering and to increase the numbers of flowers and viable seeds in *Pinus, Larix, Abies, Alnus, Pseudotsuga* and *Populus*, treatments with auxins and antiauxins are being carried out at Wächtersbach.

2263 *Krahl-Urban, J. Einiges über Eichen- und Buchenrassen. (Information on oak and beech races). (pp. 159–60).*

In provenance trials of *Quercus sessiliflora, Q. pedunculata* and beech, established in 1948 at various German and one Swedish locality and involving trees of German and other origin, marked differences in height, vegetative rhythm, tendency to form Lammas shoots, and resistance to frost and mildew are already apparent among trees of different provenance. Provenance trials of *Q. borealis* are also being carried out. In addition a survey of the characters of oaks and beeches in autochthonous stands in Germany and other European countries has been undertaken with a view to determining relationships between climatic factors and racial characteristics and selecting plus trees of different provenance races.

2264 *Langner, W. Gedanken zur Lärchenzüchtung auf Grund der Ergebnisse des Büdinger Lärchenkreuzungsversuches. (Thoughts on larch breeding on the basis of larch crossing experiments at Büdingen). (pp. 160–61).*

In trials set up in 1954 the tested trees could be arranged in descending order of height as follows: F_1 *Larix leptolepis* x *L. europaea, L. leptolepis*, F_2 *L. leptolepis* x *L. lepteuropaea* and *L. europaea*, but the difference between the first two was not significant. The F_2 hybrids were highly variable. A marked inbreeding depression was noted in selfed, sib-crossed and half-sib-crossed *L. leptolepis.* In another case of inbreeding no depression was observed in the progeny. The use of test crosses prior to establishing seed plantations is recommended.

2265 *Schmitt, R. Produktion von Forstsaatgut in Samenplantagen. (The production of forest seed in seed plantations). (p. 161).*

The genetical and other advantages of seed plantations established with grafts of plus trees and trees from plus stands are outlined with special reference to plantations set up in 1956 in Hesse [cf. XXVII, 2278].

2266 *Seitz, F. W. Individualkreuzungen mit Leuce-Pappeln. (Individual crosses of* Leuce *poplars). (pp. 161–62).*
The year-old progenies of one female and four male grey poplar parents from a single population at Ingolstadt, Germany, showed significant differences in growth. The possibility of using the vigorous progeny of individual crosses, either by repetition of the cross on a large scale or vegetative propagation of the best types, is indicated.

2267 Andersson, E.
Berichte: Aus der Arbeit der schwedischen Forstplanzenzüchtung. (**A report on forest-tree breeding in Sweden**).
Silv. genet. 1957 : **6** : 191–98.
The author described the organization of forest-tree breeding work in Sweden, touching briefly on all aspects of the work in hand. He makes special reference to the criteria used in the selection of plus trees for breeding purposes and to seed nurseries, of which six types are recognized.

2268 Johnson, L. P. V.
The role of natural selection in the improvement of shelterbelt trees.
Agric. Inst. Rev. 1957 : **12** : No. 5 : 13–14, 36.
After describing examples of natural selection in operation in several types of habitat in Alberta the author discusses the value of such observations as an aid in the selection of seed trees.

2269 Rohmeder, E.
Altersphasenentwicklung der Waldbäume und Forstpflanzenzüchtung. (**Phasal development of forest trees and forest tree breeding**).
Silv. genet. 1957 : **6** : 136–42.
Examples of differences between juvenile and adult foliage are given, trees in the juvenile phase being characterized by an inability to flower, and cuttings from them having better rooting capacity than those from adult forms. It is suggested that for seed orchards scions from adult material able to flower should be used while for the propagation of desirable genotypes or for clonal tests juvenile material should be employed.

2270 Strand, L.
Pollen dispersal.
Silv. genet. 1957 : **6** : 129–36.
Formulae for the dispersal of small particles from point, line and plane sources are developed. In investigations on isolated spruce and pine trees good agreement was obtained between theoretical and observed pollen densities over short distances. Density falls off very rapidly with distance, so that a tree will generally be pollinated largely by its nearest neighbour. On steep hill sides cross pollination up hill and down hill tends to be prevented partly by distance and partly by the retardation in flowering time with altitude. In isolating a seed orchard, its distance from any other stand, its size and the relative flowering dates of seed orchard and surrounding stands should be considered.

2271 Templin, E.
Prüfung der Anfälligkeit verschiedener Pappelsorten, -klone und -hybriden gegenüber Schädlingen aus der Insektenwelt. (**Testing the susceptibility of different poplar varieties, clones and hybrids to insect pests**).
Verh. dtsch. Ges. angew. Ent. 1954 (1955) : 73–83.
Investigations on the reactions of numerous poplars to attack by *Saperda populnea, Thecabius affinus, Pemphigus spirothecae* and *P. populinigrae* in Germany are reported. Black poplar hybrids were resistant to the last three and were among the least susceptible to the first.

2272 Tralau, H.
Über eine haploide Form von *Populus tremula* aus Uppland. (**On a haploid form of *P. tremula* from Uppland**).
Bot. Notiser 1957 : **110** : 481–83.
Root-tip cells of a specimen growing in Uppland, Sweden, showed $2n = \pm 19$, the usual diploid number being $2n = 38$. The haploid plant was also characterized by its small leaves and bushy habit.

2273 Roosen, P.
La teneur en eau des tiges de peupliers euraméricains en Belgique. (**The water content of the trunks of Euramerican poplars in Belgium**).
Bull. Inst. agron. Gembloux 1957 : **25** : 179–97.
Observations are recorded on the content and distribution of water in the trunks of four varieties of *Populus*; these were studied in various environments.

2274 van den Ende, G.
Het onderzoek over de populierenkanker veroorzaakt door *Pseudomonas syringae* v. Hall f. sp. *populea* Sabet. **(The study of poplar canker caused by *Ps. syringae* v. Hall f. sp. *populea* Sabet).**
Meded. LandbHoogesch. Gent 1957 : **22** : 527–32.

Reaction to inoculation varied from year to year in different species, *Populus gelrica*, *P. serotina* var. *erecta* and *P. nigra* var. *italica* being generally resistant. In tests of crosses, those involving *P. nigra* or *P. nigra* var. *italica* gave the highest percentage of resistant seedlings. The time of assessment of resistance was of importance, since the severity of the symptoms after the first year following inoculation decreased in some species, e.g. *P. serotina*, while in other species such as *P. brabantica* it increased.

2275 Cash, E. K. & Waterman, A. M.
A new species of *Plagiostoma* associated with a leaf disease of hybrid aspens.
Mycologia 1957 : **49** : 756–60.

Fungi attacking F_1 progenies of crosses within *Populus tremuloides* and *P. grandidentata* and of crosses between these two species in a plantation in Massachusetts included *Plagiostoma populi* sp. nov.

2276 Johnsson, H.
Aktuellt om hybridasp. **(Current information on hybrid aspen).**
Skogen 1957 : **24** : 798, 801.

The *Populus tremuloides* x *P. tremula* hybrids referred to earlier [XXIII, 2996], have so far fulfilled predictions regarding their height, diameter and volume at various ages up to 14 years. Their form is good and the wood suitable for veneers and match boxes. Their chief defect seems to be a tendency to attack by *Valsa sordida* and *V. nivea*, the former occurring in a plantation in Brunsberg and the latter in two plantations in Skåne and one in Mykinge. Most of the families attacked by *V. nivea* derive from a single *P. tremuloides* tree.

2277 Perényi, M.
Nyárfa-konferencia. **(Poplar conference).**
Erdész. Kutat. 1957 : No. 1–2 : 3–18.

At the above conference, organized by the Hungarian Academy of Sciences and held from 23 to 29 September 1956, F. Kopecky reported that introduced hybrids are adversely affected by short photoperiods under Hungarian conditions, so that, although they grow vigorously, vegetative growth ceases sooner than in native poplars. Introduced material was also more susceptible to diseases.

2278 Hylander, N.
On cut-leaved and small-leaved forms of Scandinavian birches.
Svensk bot. Tidskr. 1957 : **51** : 417–36.

This survey of birches with aberrant leaf forms contains descriptions and illustrations of 12 forms of *Betula verrucosa*, two forms of *B. pubescens* and seven forms which are regarded as nothomorphs of *B. pubescens* x *B. verrucosa*.

2279 Mizushima, M.
On a hybrid of Alnus. (Critical studies on Japanese plants 2).
Shokubutsu Kenkyu Zasshi/J. Jap. Bot. 1957 : **32** : 1–5.

A description is given of a sterile hybrid between *A. crispa* subsp. *maximowiczii* and *A. pendula*. It was found on Mount Iwaki in the prefecture of Aomori and is designated *A.* x *hosoii*.

2280 Hylander, N.
On cut-leaved and small-leaved forms of *Alnus glutinosa* and *A. incana*.
Svensk bot. Tidskr. 1957 : **51** : 437–53.

Scandinavian alders with laciniate or otherwise anomalous leaf forms described and illustrated in this review include seven forms of *A. glutinosa*, 13 of *A. incana*, one of *A. incana* var. *argentata*, one of *A. incana* var. *virescens* and one nothomorph of *A. glutinosa* x *A. incana*.

2281 Pryor, L. D.
An F_1 hybrid between *Eucalyptus pulverulenta* and *E. caesia*.
Proc. Linn. Soc. NSW 1956 : **81** : 97–100.

Using the first of the above species as the female parent a number of hybrid seedlings have been produced showing characters intermediate between those of the parents, which belong to different sections of the genus, and equalling *F. pulverulenta* in vigour. It is suggested that failure of the reciprocal cross may be due to the greater length of the style in *E. caesia*.

2282 Pryor, L. D.
The identity of *Eucalyptus subviridis* Maiden and Blakely.
Proc. Linn. Soc. NSW 1956 : **81** : 101–04.

Evidence is presented confirming that *E. subviridis* is a hybrid between *E. cinerea* and *E. blakelyi*. Both the cross *E. cinerea* x *E. blakelyi* and its reciprocal were successful, giving progeny resembling *E. subviridis*. Mention is made of other naturally occurring hybrids involving *E. cinerea*.

2283 PRYOR, L. D.

Variation in Snow Gum (*Eucalyptus pauciflora* Sieb.).

Proc. Linn. Soc. NSW 1957 : **81** : 299–305.

"Variation in Snow Gum (*E. pauciflora* Sieb.) populations is described. In continuous stands linear correlation between a number of characters and elevation is found. Genotypic variation is found to accompany phenotypic variation. Heritable variation is found likewise in stands which occur separately over wide areas. The Snow Gum population varies clinically* in several directions showing correlation with habitat variation and it is implied that such a variation has adaptive value. Taxonomically it is considered that the whole population should be regarded as one species and referred to *E. pauciflora* Sieb. The term 'cline-form' is proposed for a reference point within any part of the population, and it is considered that *E. niphophila* Maiden and Blakely, *E. de Beuzevillei* Maiden and *E. pauciflora* Sieb. var. *nana* Blakely should be suppressed and regarded not as species or varieties but as cline-forms. Many *Eucalyptus* species exhibit in some degree the same kind of variation."

[Author's summary].

2284 KOPECKY, F.

Néhány adat az akác nemesítéséhez. **(Some data on breeding *Robinia*).**

Erdész. Kutat. 1957 : No. 1–2 : 19–29.

In work carried out at the Hungarian Institute of Forestry Science, scions from mature *R. pseudoacacia* trees flowered readily when grafted on to young seedlings. Studies of floral biology indicated that the male and female organs mature simultaneously, at the same time as the wing of the flower expands, and that pollination is effected by insects only, chiefly bees. Maximum pollen germination in both *R. pseudoacacia* and *R. pyramidalis* was obtained in a 50% sucrose solution.

2285 ALEJANDRO, N. G.

Study of meiosis in *Ginkgo biloba* L. with special reference to the cytoplasmic granules.

Natural appl. Sci. Bull., Quezon City 1954 : **14** : 265–89

Staminate buds were used in these studies; meiosis appeared to be normal, except for the appearance of chromosomal fragments and chromatid bridges in some of the cells. The development of plastids from cytoplasmic granules is discussed.

2286 SCHREINER, E. J.

We need better white pines for the Northeast.

Morris Arbor. Bull. 1957 : **8** : 39–40, 48.

The possibilities of developing white pines combining resistance to diseases and insects with satisfactory growth and wood properties, for the north-east of the USA, are discussed. Sufficient inherent resistance to blister rust has been found in *Pinus strobus* to warrant the assumption that intraspecific selection should result in resistant types. Testing *P. strobus* for resistance to weevil has been initiated. Adaptability tests of races and selection of superior individuals for use in hybridization and seed orchards are also under way with this species. In addition, exotic white pines are being studied.

2287 CRITCHFIELD, W. B.

Geographic variation in *Pinus contorta*.

Publ. Maria Moors Cabot Found. 1957 : No. 3 : Pp. 118.

On the basis of an analysis of the variation shown by natural and cultivated populations of *P. contorta* in western North America with respect to leaf, seed-cone, seed and seedling characters, four geographically distinct subspecies are recognized which correspond more or less closely with taxa of specific or varietal rank previously described in the literature: (1) ssp. *contorta*, consisting of the coastal populations in a region extending from Alaska to almost as far as Cape Mendocino in northern California; (2) ssp. *bolanderi*, found along the coast in Mendocino County, Calif.; (3) ssp. *latifolia* in the Rocky Mountains; and (4) ssp. *murrayana* in the Sierra Nevada. (1) is effectively isolated from the two inland subspecies by distributional gaps but its distribution is continuous with that of (2). Only resin-canal number exhibits a pronounced north-south gradient in the coastal region. Ssp. *bolanderi* is restricted to a highly acid, hardpan soil. This subspecies, and the immediately adjacent coastal population, which together are geographically isolated from other coastal populations, are unique in possessing leaves entirely devoid of resin canals. Within the inland region, many characters vary clinally with altitude, populations at low altitudes generally having narrower and longer leaves with fewer resin canals, as well as heavier and more reflexed cones, than populations at high altitudes. In the Rocky Mountains the frequency of closed and highly persistent cones also increases with altitude. Continuous geographical clines in several features connect (3) and (4), the most significant gradient being that linking the closed-coned subspecies of the Rocky Mountains with the open-coned subspecies of the Sierra Nevada. It is suggested that forest fire has been the evolutionary agent primarily responsible for the divergence between (3) and (4) in habit and related characteristics of the cone. These two subspecies, usually regarded as a single taxon by previous workers, correspond to the evolutionary trend postulated for cone features within sect. *Diploxylon*. Populations in the Cascade and Blue Mountains are intermediate in many respects but only those in the former mountains are contiguous with both inland subspecies. This restriction of the area of possible gene exchange, together with distance, appears to have supplied the necessary isolation for regional differentiation. Ssp. *murrayana* is on the whole the most highly differentiated of the three widely distributed subspecies. The pattern of geographical variation in cone orientation suggests that introgression of *P. contorta* by *P. banksiana* may be occurring, the region of hybridization being centred in the northern Rocky Mountains. The variation shown by greenhouse-grown seedlings of different geographical origins adumbrated the variation in natural populations in the case of some characters, e.g. leaf width. Geographical disparities in leaf length of seedlings were however almost the reverse of those found between the parental wild populations of adult trees. Furthermore, resin canals were relatively uniform in number and almost invariably present in seedling leaves, in marked contrast to resin-canal production in adults. Variation in the growth period of first-year seedlings, unlike germination behaviour, was related with considerable exactitude to the local climates of the places of origin.

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* Presumably "clinally."

2288 TOYAMA, S., SOMEGO, M. & KUBO, I.
[Characteristics of the trunk of tetraploid *Pinus thunbergii*. (Forest-tree breeding and fundamental studies on it. XXVI)].
Miyazaki Daigaku Gakugei Gakubu Kenkyu Jiho/Miyazaki Univ. Bull. Fac. Liberal Arts Educ. 1956 : **1** : 137–46. [Japanese].

A comparative study of young trunks of diploid and colchicine-induced tetraploid strains is presented. The tetraploids differ from the diploids in their reduced height, thicker bark, higher ratio of autumn/spring wood, shorter tracheids and more uniform distribution of resin canals.

2289 TOYAMA, S. & NISHIMURA, S.
[Chlorophyll grains in the needles of tetraploid *Pinus thunbergii* (Forest-tree breeding and fundamental studies on it. XXVII)].
Miyazaki Daigaku Gakugei Gakubu Kenkyu Jiho/Miyazaki Univ. Bull. Fac. Liberal Arts Educ. 1956 : **1** : 147–51. [Japanese].

The needles of colchicine-induced tetraploids had longer parenchymatous cells in the mesophyll, a slightly greater density of chlorophyll grains in each cell and larger chlorophyll grains than in the diploid form.

2290 EHRENBERG, C. & GUSTAFSSON, Å.
Plus- och minusträd: urval och avkommeprövning. **(Plus and minus trees: selection and progeny testing).**
Skogen 1957 : **44** : 722–28.

Some results of crosses involving two plus and two minus trees of *Pinus sylvestris* at Boxholm, Sweden, are presented. The progeny of one of the minus trees, VIII : 46, both from open pollination and from reciprocal crosses with the other three trees, contained a high proportion of trees showing forking of the main shoot and other abnormalities, indicating that the characters are dominant or semidominant. The other minus tree, VIII : 47, approached the plus trees in the proportion of normal plants found among the open-pollinated progeny, although a number of abnormalities of branching were observed. The offspring of the plus trees were not only better in form than those of the minus trees but were also more vigorous both in the nursery and in field plots. The tree VIII : 46 was further characterized by its ability to transmit a high degree of prolepsis to its progeny from crosses with either of the plus trees but not to those from open pollination or from crosses with VIII : 47. The bearing of these results on selection is discussed.

2291 TOYAMA, S.
(On sterility in pines).
Miyazaki Daigaku Jiho (Shizenkagaku)/ Bull. Miyazaki Univ. (Nat. Sci.) 1950 : No. 1 : 31–40. [Japanese].

Seed setting has been studied following open pollination and self, interstrain and interspecific crossing involving *Pinus densiflora* and *P. thunbergii*. Self sterility is high in *P. densiflora* and *P. densiflora* x *P. thunbergii*. Seed is readily obtained from selfed *P. thunbergii* and from the various interstrain and interspecific crosses. Some intraspecific cross incompatibility was observed in *P. thunbergii*.

2292 Schröck, O.
Beobachtungen an der Nachkommenschaft einer Zapfensuchtkiefer. **(Observations on the progeny of a pine exhibiting abnormally high cone production).**
Silv. genet. 1957 : **6** : 169–78.

This is the full version of a paper already summarized [cf. 2255].

2293 Tralau, H. W.
Beitrag zur Kenntnis der Variabilität der Fichte. II. Die Wirkung von γ-Strahlung auf *Picea abies*. **(Contribution to the knowledge of variation in spruce. II. The influence of γ radiation on *P. abies*).**
Bot. Notiser 1957 : **100** : 422–54.

Seeds from spruces from two localities in Germany and two in Sweden were subjected to γ-ray dosages up to 1200 r. Germination and growth were slightly stimulated at low doses and markedly decreased at 1200 r., seed of the most northerly provenance being the most susceptible to high doses. The difference in reaction between this and the three more southerly forms is regarded as being due to genetically determined physiological variation.

2294 Ostapenko, B. F.
(A rare form of spruce).
Priroda (Nature), Leningrad 1957 : No. 8 : p. 115. [Russian].

A weeping form of *Picea excelsa*, found in the province of Černovicy, is described.

2295 Gathy, P.
À propos de l'hybride natural *Abies concolor* (Gord.) Engelm. x *Abies grandis* Link. **[Concerning the natural hybrid *A. concolor* (Gord.) Engelm. x *A. grandis* Link.].**
Silv. genet. 1957 : **6** : 186–90.

The author reports a study of 251 young trees grown from seed obtained in 1951 from a specimen of *A. concolor* in an arboretum near Bruges, growing at a distance of 20 m. from a specimen of *A. grandis*. Eighty (32%) of them were assigned to the former species and 106 (42%) to the latter, the remaining 65 (26%) being intermediate. In the colour of the needles, arrangement of the stomata and growth rate, the intermediate forms resembled *A. grandis* but in several details of structure the needles were of an intermediate type. Heterosis was not apparent [cf. XXVI, 3816]. Comparison with published data for *A. lowiana* in regard to needle characters showed that this species likewise occupies an intermediate position between *A. concolor* and *A. grandis*. The stages in the putative evolution of these three closely related species from a common ancestral species are outlined, with special references to the way in which their present distribution and ecological status in North America reflects past geoclimatic developments.

2296 Lundberg, J.
Proveniensforsøg med Douglasgran. **(Provenance trials of Douglas fir).**
Forstl. Forsøgsv. Danm. 1957 : **23** : 345–70.

The results of provenance trials held in nine localities in Denmark are described. The majority of the types tested were from the north-western USA, samples from west of the Cascade Range doing better than those from the east. In trials in which heights were measured, relative height increased with increasing latitude of origin. Of the four European samples, the two Danish were on a level with the best American, while the two German performed less well. No distinct difference in incidence of *Phaeocryptopus gaeumanni* was observed among the different samples.

2297 Orr-Ewing, A. L.
A cytological study of the effects of self-pollination on *Pseudotsuga menziesii* (Mirb.) Franco.
Silv. genet. 1957 : **6** : 179–85.

In 1952 self and cross pollinations [cf. XXVII, 3493] were performed on two Douglas firs, in one of which self pollination caused a drastic fall in the number of viable seeds [cf. XXI, 2179]. Cytological study of ovules from sample cones taken from this tree at intervals after self and cross pollination showed that pollination, fertilization and proembryo formation proceeded normally after self pollination and that the inhibition of normal seed development occurred at some time during the development of the embryo. In 1954 a similar experiment was carried out with six trees. The appearance of the ovules was found to give a reliable indication of the effects of self pollination, thus rendering seed tests unnecessary. Ovule abortion following self pollination was pronounced in three of the trees and complete in one. Discussion of these findings led to the conclusion that embryo collapse resulted from incompatibility between the young embryos and their gametophytes, this being an inbreeding effect caused by increasing homozygosity for recessive deleterious genes. As the number of such genes would not be constant from tree to tree this explanation accounts for the differences in the severity of the effect in different trees.

VEGETABLES

2298 **Annual Report of the Glasshouse Crops Research Institute, Littlehampton, Sussex 1954-1955** (1957) : Pp. 108.

The results of cucumber and tomato variety trials are reported; many of the tomato hybrids had Potentate as one parent. Analyses were made of the expressed sap from the fruit of ten varieties of tomato. Some cucumber crosses were made.

2299 Hahn, P. & Mildner, E.
Über die Zulassung einer neuen Buschtomatensorte und die Ursachen der Streichung bekannter Handelssorten in der Sortenliste 1957. (**On the approval of a new bush tomato variety and the causes of the removal of some well known market varieties from the 1957 variety list**).
Dtsch. Gartenbau 1957 : **4** : 234–35.

Rotkäppchen [Little Red Riding Hood] tomato has replaced Jubiläum; it grows more vigorously and produces a higher yield, but ripens a little later. The resistance to leaf roll is good.

The red cabbage Frührot [Early Red] was rejected because of the variation in performance found between seed from different stocks. The dwarf-bean varieties Glückauf, Paas Lintorfer Frühe [Paa's Lintorf Early] and Wachs Gärtnerstolz [Gardeners' Pride Wax] are considered unsatisfactory because of their susceptibility to *Colletotrichum lindemuthianum*.

2300 Evdokimov, M. M.
(**Varietal testing and the standardization of vegetable crops including cucurbits**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 67–69. [Russian].

Beetroot. New Soviet-bred varieties, some of which have been approved as standards in the different geographical zones, are described. Poljarnaja Ploskaja [Arctic Flat] and Severnyj Šar [Northern Globe] are nonbolters with a yield of 226–254 c. per ha. under subarctic conditions. The new variety Gribovskaja Ploskaja A473 [Gribovo Flat A473] has a high vitamin C content and outyields Egypt by 30–50% in the Nonchernozem Zone. Puškinskaja Ploskaja K18 [Puškin Flat K18], Sibirskaja Ploskaja 167/367 [Siberian Flat 167/367] and Donskaja Ploskaja 367 [Don Flat 367], standards respectively in northwestern Russia, Siberia and southeastern Russia, also show yield improvements over Egypt and are rich in vitamin C.

Onion. Mention is made of early and hardy outdoor varieties such as Odnoletnij Sibirskij [Annual Siberian] which yields 190 c. per ha. under the conditions of Jakutia.

Cabbage. High yielding varieties with different maturity dates have been developed. They include Stalingrad 42, White Russian 138 which is tolerant of high temperatures, Nomer Pervyj Poljarnyj [Number One Arctic], a nonbolter adapted to cultivation in the subarctic region, and Zimnjaja Gribovskaja [Winter Gribovo] which keeps well and is suitable for the preparation of sauerkraut.

Melon. Many varieties of melon and water melon, differing in maturation period and distinguished by high quality and good transportability, have been bred. Among the melons, special mention is made of Guljabi Zelenaja [Green Guljabi] and Guljabi Oranževaja [Orange Guljabi], which were derived from central Asiatic material.

Pumpkin. Among the new high-yielding varieties are Mindal'naja 35 [Almond 35], which is used for human consumption, and the forage types Krupnoplodnaja I [Large-fruited I] and Vitaminnaja [Vitaminiferous].

Cucumber. A reference is made to the new outdoor variety Don 175 which produced up to 1000 c. per ha. under the conditions of Krasnodar. The new indoor varieties Leningradskij Tepličnyj [Leningrad Hothouse], Dlinnoplodnyj [Long-fruited] and Mnogoplodnyj [Many-fruited] outyield Klinskij by 25–38% and Parnikovyj 6 [Glasshouse 6] yields 50–100% more fruit than Nerosimyj [Rainfed].

Tomato. Karlik 1185 [Dwarf 1185], with a yield of 542–703 c. per ha., produces 93% ripe fruits in the Komi ASSR. Majak 12/20–4 [Lighthouse 12/20–4] and several others grown in the glasshouse or in the open are distinguished by earliness, high yield and a high dry-matter content. Glasshouse tomatoes such as Leningradskij Skorospelyj [Leningrad Early] and Ural'skij Mnogoplodnyj [Ural Many-fruited] yield 20–36% more fruit than Lučšij iz Vseh [Best of All] and other older varieties. The productive and early Alpat'eva 905a [Alpat'ev's 905a] has a habit suitable for combine harvesting.

2301 Rybakova, V. D.
(**Second youth**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1957 : No. 11 : 75–76. [Russian].

Some of the plant breeding achievements of the Latvian breeder P. Ja. Dindonis are described on the occasion of his eightieth birthday.

2302 Langenfel'd, V. T.
(The breeder P. Ja. Dindonis).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 7 : 78–79. [Russian].

Mention is made of the following varieties of vegetables bred by Dindonis at the Buldur Horticultural College, Latvia: high-yielding cabbages with firm heads or moderate soil requirements, a productive sweet corn variety with a 20% sugar content, a pumpkin with soft seeds rich in oil and protein, cucumbers for indoor or outdoor use that will not turn yellow, tomatoes resistant to blight and soya beans which reach maturity under Latvian conditions.

2303 Rapport du Ministre de l'Agriculture de la Province de Québec pour l'année finissant le 31 mars, 1955. **(Report of the Minister of Agriculture of the Province of Quebec for the year ending 31 March, 1955).** Pp. 232.

Some crosses between the tobacco varieties Delcrest and Cannelle were found promising in respect of quality and earliness. Breeding of maize, potato, fruit crops, tomato and onion is also in progress.

2304 Pech, W.
Die Problematik und der derzeitige Stand der Gemüsezüchtung in einigen volksdemokratischen Ländern. **(The problems and the present day position of vegetable breeding in some of the people's democratic countries).**
Dtsch. Gartenbau 1957 : **4** : No. 8 : Suppl. : 13–15.

Brief reports are presented on the breeding methods used in Bulgaria, the USSR, Czechoslovakia and the German Democratic Republic. In the Bulgarian report, breeding for heterosis is discussed while the Soviet report deals with the application of Mičurin's theories.

2305 Samarin, P. I.
(Introduction of new vegetable varieties on the collective farm).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 9–10. [Russian].

New varieties of cabbage, cucumber and tomato cultivated in the Stalingrad province are mentioned. The cabbage Sud'ja 146 [Judge 146] is tolerant of heat and moderate in moisture requirement. The cucumber Vjaznikovskij ripens early and Rjabčik 357/4 [Partridge 357/4] is highly productive of fruits which may be eaten fresh or pickled. The tomatoes Skorospelyj Volžskij 288 [Early Volga 288], Ahtubinsk 85 and Stalingrad 5/95 outyield the standard Majak 12/20–4 [Lighthouse 12/20–4] and have a higher dry-matter content. Their transportability is good.

2306 Ferguson, J. H. A.
Photothermographs, a tool for climate studies in relation to the ecology of vegetable varieties.
Euphytica, Wageningen 1957 : **6** : 97–105.

A method of expressing the relationship between temperature and photoperiod in any given locality by means of "photothermographs" is described. With reference to data already reported in the literature, use of the charts is illustrated by an analysis of these two factors in relation to the transition from the vegetative to the reproductive stage and *vice versa* in sugar and table beets. A so-called neutral line superimposed upon a photothermograph provides an indication of the critical combinations of temperature and photoperiod for induction of flowering. It is however suggested that the term neutral zone is preferable to neutral line since some individual-plant differences in bolting behaviour may usually be expected within a variety. From data on sowing dates, the positions of the neutral zones are deduced for early and late varieties of sugar and table beets under conditions in the Netherlands. The possible development of the photothermographic method as a means of predicting the productivity of crop varieties in a particular region is briefly discussed.

2307 Trulevič, V. K. & Tul'ženkova, F. F.
(Vegetable growing in the Far North).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 63–67. [Russian].

Mention is made of the carrot Hibinskaja Poludlinnaja [Hibiny Semi-long], which outyields Nantes by 30–40% at Hibiny. Other varieties of vegetables, bred at the various Soviet institutes in the sub-arctic, include a swede, a cabbage and an outdoor tomato which regularly yield well in the severe northern climate. The most productive indoor varieties of cucumber and tomato are listed.

2308 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1956, IV. (Im Rahmen der österreichischen Zuchtbuchkommission). **[Results of vegetable variety trials 1956, IV. (In connexion with the Commission for the Austrian Book of Cultivated Varieties)].**
Mitt. Klosterneuburg 1957 : **7** : 331–44.

Results of tests with varieties of lettuce, tomato and dwarf bean are reported.

2309 Nilca, V. *et al.*
Rezultatele experienţelor cu soiuri de tomate, morcovi şi varză în cîteva gospodării agricole colective din regiunea Cluj. (**The results of experiments with tomato, carrot and cabbage varieties in some collective state farms in the region of Cluj**).
Anu. Lucr. şti., Cluj 1957 : **13** : 153–73.

Varietal trials with the above crops are reported and recommended varieties are listed.

2310 Ušakova, E. I.
(**Urgent tasks in the breeding and seed production of vegetables**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 6–9. [Russian].

Reference is made to the hardy nonbolting beetroot variety Podzimnjaja [Winter] from the Arctic Branch Station of the Institute of Plant Industry. It produced a higher percentage of bolters when propagated under Moscow conditions.

2311 Banga, O., de Bruyen, J. W. & van Bennekom, J. L.
Praktijkproeven vroege kroten 1955–1956. (**Practical trials of early beetroots, 1955-1956**).
Meded. Dir. Tuinb. 1957 : **20** : 774–79.

Details of earliness, tendency to bolting, colour and other characters are given for 26 selections of Egyptian, Early Wonder and Crosby tested at Wageningen, Netherlands. Twelve of the selections are recommended for early culture.

2312 El Murabaa, A. I. M.
Effect of high temperature on incompatibility in radish.
Euphytica, Wageningen 1957 : **6** : 268–70.

Plants of clones of Kleine Ronde Witpunt [Small Round White-tip] and IJskegel [Icicle] were cross-pollinated or selfed at 17° and 26°. In cross-compatible pollinations, fruit set, average number of seeds per siliqua and total seed yield were reduced at the higher temperatures. With selfing of self-incompatible plants, fruit set and total seed yield were significantly greater at 26° C.; the increase in the average number of seed per siliqua was not however significant. It is concluded that high temperature weakens the incompatibility reaction between pollen and style so that a small increase in seed set is obtained.

2313 Helm, J.
Über den Typus der Art *Raphanus sativus* L., deren Gliederung und Synonymie. (**The type of the species *R. sativus* L. and its subdivision and synonymy**).
Kulturpflanze, Berlin 1957 : **5** : 41–54.

From a study of the early literature on the radish a scheme is presented according to which the turnip radishes, in which the thickened portion consists exclusively of hypocotyl, were derived by selection from the long-rooted radishes in which it consists partly of the root too. The two types are considered to be distinct botanical varieties, the turnip radishes being regarded as the type for the species *R. sativus*. On this basis a key for the identification of the botanical varieties is presented, with indications of the main horticultural types that come into each.

2314 Frey, E.
Beobachtungen beim Topinambur-Anbau. (**Observations on Jerusalem artichoke cultivation**).
Mitt. schweiz. Landw. 1957 : **5** : 209–11.

At Witzwil, the new variety Topine gave a high yield of tubers and foliage; it is recommended for silage.

2315 **Attempt to develop better onion hybrids.**
Iowa Fm. Sci. 1957 : **12** : No. **3** : 9–10.

Hybrids with Spanish as one parent gave the highest yields in trials held in Iowa. Crosses between Texas Early Grano 951 and some promising inbreds gave good performance in soils with a high mineral content.

2316 Rollen, A.
Action de l'alcool isoamylique sur la division cellulaire chez l'*Allium cepa* L. (**The action of isoamyl alcohol on cell division in *A. cepa***).
Bull. Soc. bot. Fr. 1957 : **104** : 245–55.

Weak solutions of isoamyl alcohol were found to have a mitodepressive action on the nuclei of cells of *A. cepa*; higher concentrations were lethal. The action of isoamyl alcohol is compared with that of octanol [cf. XXV, 2570].

2317 Konvička, O.
Vyšetření odrůd kuchyňské cibule (*Allium cepa*) československého sortimentu k produkci sazeček. (**Testing Czechoslovakian varieties of cooking onion (*A. cepa*) for production of sets**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1957 : **30** : 645–58.

Kaštice was the most resistant to bolting among varieties tested at Olomouc and several others did not differ in this respect from Všetatská, which is customarily used for the production of sets.

2318 Kurita, M.
Karyotypes of some species in *Allium*.
Ehime Dagaku Kiyo/Mem. Ehime Univ. : Ser. 2 B : 1956 : **2** : 239–45.

Caryotypes are described for the following species: *A. subhirsutum*, *A. schoenoprasum* vars. *shibutsuense* and *foliosum*, *A. sphaerocephalum*, *A. vineale* and *A. monophyllum*.

2319 Braak, J. P. & Zeilinga, A. E.
Production of a colchicine-induced tetraploid asparagus.
Euphytica, Wageningen 1957 : **6** : 201–12.

In experiments on the technique of colchicine treatment of asparagus at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, the infiltration method devised by Mrkos [cf. XXI, 95] and involving the use of a water vacuum pump has been found preferable to soaking the seeds. The sensitivity of the seedlings to treatment increased with age. Seedlings eight days old nearly died after the application of very weak solutions but seedlings aged five days withstood a concentration of 1·6%, tetraploidy being induced in 60% of the seedlings. Twenty-six out of 30 C_0 plants gave rise to tetraploid progeny; these 26 plants have maintained their tetraploidy two years after the initial test. A ratio of 5 males to 1 female has been found in C_1 generations. It is assumed that out of every five males, 4 are simplex (*Mmmm*) and one is duplex (*MMmm*). Since from the grower's point of view ♂ plants are preferred, selection of the duplex tetraploids by means of test crosses is advocated since pollination of the nulliplex females by simplex males will only give a 1 : 1 ratio of ♀ and ♂ plants.

2320 Shibata, K.
[Cytogenetical studies on F_1 plants of *Brassica pekinensis* (4*x*) x *B. napus*].
Senshokutai (Chromosome)/Kromosomo 1956 : Nos. 30–31 : 1029–35. [Japanese].

The F_1 hybrids have 39 chromosomes (genome aaac); the meiotic chromosome configurations vary greatly, the range being $0\text{–}4_{\mathrm{IV}} + 1\text{–}5_{\mathrm{III}} + 5\text{–}1_{\mathrm{II}} + 1\text{–}7_{\mathrm{I}}$. It is inferred that 5–7 cases of allosyndetic pairing occur between the a and c genomes and 1 case of autosyndesis occurs within the c genome. Laggards and bridges are frequent at anaphase I but pollen fertility may be as high as 83·3%. The F_1 plants are self-sterile but cross-fertile with open pollination.

2321 Shibata, K.
(Self and cross incompatibility in autotetraploid *Brassica pekinensis* III. Gene analysis of individuals originating from $S_1S_1S_1S_4$ and $S_1S_1S_4S_4$).
Nogyo Shuho/J. agric. Sci., Tokyo 1957 : **3** : 185–91. [Japanese].

Progenies were raised from $S_1S_1S_4S_4$ plants (selfed in the bud), $S_1S_1S_1S_4$ (selfed in the bud), $S_1S_1S_1S_4$ x $S_4S_4S_4S_4$, $S_1S_1S_1S_4$ x $S_3S_3S_3S_3$ and $S_1S_1S_1S_4$ x $S_1S_2S_3S_3$ and tested for compatibility by crossing with homozygous, S_1, S_2, S_3 and S_4 strains. It is concluded that S_1S_2, S_2S_3 and S_3S_3 pollen grains function on $S_1S_1S_1S_4$ styles. $S_1S_1S_1S_3$, $S_1S_1S_2S_3$, $S_1S_1S_2S_4$, $S_1S_1S_3S_4$ and $S_1S_2S_3S_4$ plants are self incompatible. S_1 is recessive to the other alleles in heterozygous pollen. [Cf. XXVII, 2346].

2322 Konvička, O.
Skladovatelnost zelí. Zjištění korelačních vztahů mezi skladovatelností a jinými vlastnostmi. **(The keeping quality of cabbage. Studying correlations between the keeping quality and other characteristics).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinńa Výroba 1957 : **30** : 559–84.

Keeping quality was found to be a varietal character negatively correlated with the size of head and dry-matter content and positively correlated with growth period and crude cellulose content of the green matter. It was found that keeping quality was not directly correlated with stalk length within the head.

2323 Konvička, O., Lužný, J., Toul, V., Pospíšilová, J. & Hovadík, A.
Prošetření vlastností československého zelí se zřetelem na jeho zpracování mléčným kysáním. **(A study of the properties of Czechoslovakian varieties of cabbage from the view point of lactic-acid fermentation).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinńa Výroba 1957 : **30** : 605–32.

Dobrovodské, Klokotské and Pisárecké had the best fermenting properties for sauerkraut preparation among the varieties studied on the basis of morphological and chemical analyses. It was found that the following varietal characteristics were positively correlated: firmness of head and refractive value, firmness of head and growth period and refractive value and growth period.

2324 Betzema, J.
Een nieuwe methode voor het toetsen van knolvoet (*Plasmodiophora brassicae*) in kool. [**A new method of testing for club root (*P. brassicae*) in cabbage**].
Zaadbelangen 1957 : **11** : 404–06.

A suitable means of testing breeding material for club-root resistance in the greenhouse involves planting hardened plants 5 cm. long in seed boxes containing soil from infected plots and some additional infected material. The use of pots instead of seed boxes gave unsatisfactory results and when germinating seedlings were used additional damage was caused by other fungi, making assessment difficult.

2325 Vlasov, I. A.
(**Some results of scientific research on growing vegetables including cucurbits**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : 57–62. [Russian].

A reference is made to the work conducted by the Horticultural Institute, where attempts are being made to impart the resistance to club root of the Jazyk Žavoronka [Lark's Tongue] leaf cabbage to such cabbage varieties as Moskovskaja Pozdnjaja [Late Moscow], Ladoga, Kubyška [Dumpy] and Valvat'evskaja.

2326 Bunescu, D., Voinea, M. & Iordăchescu, C.
Contribuţii la raionarea soiurilor de varza în R.P.R. (**Contributions to the regionalization of cabbage varieties in the Rumanian People's Republic**).
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 379–94.

Data are provided on the yield, quality and vegetative period of a series of local and introduced varieties grown in various localities in Rumania.

2327 Sampson, D. R.
The genetics of self- and cross-incompatibility in *Brassica oleracea*.
Genetics 1957 : **42** : 253–63.

The suggestion of Bateman [cf. XXV, 3473] that incompatibility in *B. campestris* is under sporophytic control has been confirmed in *B. campestris* var. *oleracea* 'Calabrese Green Sprouting Broccoli'. A series of multiple oppositional *S* alleles was found at one locus with three of the alleles acting independently of each other in the pollen and stigmas while the fourth was recessive to the others in the pollen and incompletely recessive in the stigma. This incomplete recessiveness of S_4 appeared to be conditioned by modifiers. Inactivation of *S* activity occurred after about eight months in some plants but the cause of this change is not yet known.

2328 Perry, B. A. & Jones, H. A.
Two new spinach hybrids developed for the south.
Sth. Seedsman 1957 : **20** : No. 10 : 26–27.

Early hybrids 424 and 425 were developed from the crosses (102 x 99) x (99 x 95) and (123 x 120) x (99 x 95) respectively. Both have outyielded Viroflay by 13 to 52% in trials held in Texas; they are immune to mildew. These hybrids develop quickly and bolt easily and are best grown as autumn or winter crops; they can be machine harvested and are suitable for canning. The seed yield is good; the hybrids are diecious.

2329 Persson, A. R. & Vik, J.
Godkjenning av sorter og stammer av salat. (**Approval of varieties and strains of lettuce**).
Forskn. Fors. Landbr. 1957 : **8** : 389–404.

Of 121 cabbage lettuces and 7 cos lettuces tested during 1953–56 at the Institute of Vegetable Growing of the Agricultural College of Norway, 54 of the former, including both butter types and crisp-leaved types, and one of the latter were approved. Details of the morphological characters and cultural requirements of all the approved varieties are provided.

2330 Oliver, E. F. & Kjelgaard, W. L.
New lettuce mutation may give resistance to bottom rot.
Sci. Fmr., Pa. 1957 : **5** : No. 1 : p. 15.

In Pennsylvania a single plant of line S46 was found to have an elongated stem which prevented the bottom leaves from touching the ground and becoming infected with *Rhizoctonia solani* (*Pellicularia filamentosa*). The inheritance of this character is being studied and crosses are being made between S46 and other varieties.

2331 Huyskes, J. A.
Witlofkwaliteit en witlofselectie. (**Quality and selection in Witlof chicory**).
Zaadbelangen 1957 : **11** : 352–55.

A brief account of the methods of family selection and mass selection recommended for Netherlands breeders is included.

2332 Filov, A. I.
(**Bush forms of cucurbits**).
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1957 : No. **3** : 39–41. [Russian].

Three bush types of cucumber, two of melon and one of pumpkin (*Cucurbita maxima*) in the world collection at Leningrad are described; all are being used in breeding work, the object being to produce forms suited to square planting. Reference is also made to a water melon with short tendrils.

2333 Tsunoda, S.
(Melon cultivation in the open).
Nogyo oyobi Engei/Agric. & Hort. 1956 : **31** : 301–04. [Japanese].

Varieties, chiefly American, suitable for Japanese conditions, are described together with some recommended F_1 intervarietal hybrids.

2334 Tanaka, M. & Mukai, T.
(Studies on artificial polyploid melons. III. On experiments on pollen germination).
Seiken Jiho/Rep. Kihara Inst. biol. Res. 1955 : No. 7 : 86–93. [Japanese].

The optimum agar culture medium for *x* pollen contained 15% sucrose at pH 6·2 while that for 2*x* pollen contained 10% sucrose at pH 5·6. A detailed description of the germination of *x* and 2*x* pollen grains on these respective media is given [cf. XXV, 2464].

2335 Filov, A. I., Hodžaev, M. M. & Dudko, P. N.
(Central Asiatic melons).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 8 : 22–23. [Russian].

Descriptions are given of the local Taškent variety Čongare, and of Ič-Kzyl [Red Flesh], a selection from the Uzbek Horticultural Research Station. The former ripens early, is highly productive and has large fruit with white tender flesh and a sugar content of 13%. Its main defect is poor transportability. The other variety is a midseason type with smaller fruits. They have juicy flesh of crunchy consistency with a 12% sugar content and a vanilla flavour. The yield is high and transportability good. The flesh can be eaten also in the dried state.

2336 Taylor, J. C.
Summit : A new wilt resistant watermelon.
Circ. La. agric. Exp. Sta. 1957 : No. 45 : unpaginated.

Summit has already been described [cf. XXVIII, 990].

2337 Saito, K.
(Studies on the induction and utilization of polyploidy in some cucurbits. III. On polyploids of American strains of water melon and of *Lagenaria*).
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **7** : 45–50. [Japanese].

Colchicine-induced tetraploid strains of American water-melon varieties were very late-maturing. The most promising forms obtained were the triploid F_1 hybrids 4*n* Asahiyamato [Japanese Rising Sun] x 2*n* Congo, 4*n* Shinyamato [New Japanese] x 2*n* Congo and triploid New Hampshire Midget. Tetraploid strains of *Lagenaria* were obtained but matured too late for crossing. [Cf. 995].

2338 Krevčenko, L. E.
(New varieties of water melon and pumpkin).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 11–14. [Russian].

The water melons Rannij 21 [Early 21] (Gumbo x Aricara), Komsomol 2 (Ljubimec Hutora Pjatigorska 286 [Pjatigorsk Farm Favourite 286] x Ažinovskij) and Krasnosemjannyj [Red-seeded] (Bagaev Muraška [Bagaev Ant] x Melitopol' 142) were bred at Krasnodar. All three combine large fruit with high yield and good transportability and keeping quality. Rannij 21 ripens earlier than Komsomol 2 and Krasnosemjannyj is a midseason type. The pumpkin Vitaminnaja [Vitaminiferous] was obtained by intravarietal hybridization of Birjučij Kut 627, some years previously. It outyields all the older forage varieties and has high contents of carotene and vitamins C and E.

2339 **Seek wilt-resistant watermelon varieties.**
Iowa Fm. Sci. 1957 : **12** : No. **3** : p. 5.

In the 1956 trials at Iowa, Charleston Gray and Chris-Cross showed high resistance to wilt; VBL–W–453, now released as Blackstone, showed fair resistance.

2340 Frimmel, F.
Vyšlechtění nové keříčkovité bezeslupkaté tykve. **(The breeding of a new cucurbit having a bush habit and soft seed coat).**
Sborn. čsl. Acad. zeměd. Věd. : Řada rostlinňa Výroba 1957 : **30** : 633–44.

Work at Lednice on improvement in oil yield of a form of *Cucurbita pepo* which arose from a cross between a form having normal habit and soft seed coat and a bush variety is described. A positive correlation coefficient between seed content and oil yield was found.

2341 Gopalakrishnan, R.
Medicinal ash-gourd—(a new variety).
Madras. agric. J. 1957 : **44** : 345–46.

A variety of *Benincasa cerifera*, not previously recorded, has been found in cultivation in Malabar, where it is said to be used in Hindu medicine. The variety is also suitable for culinary purposes, the hard-pulped and long-keeping fruits being described as slightly larger than a cricket ball. It crossed readily with the common variety of this species, the F_1 being intermediate in all morphological characters and superior in yield to both parents. The F_2 resulting from open pollination showed a wide range in size of the fruits, all of which were however smaller than those of the common variety. Because of its resistance to pests and diseases, adaptability to all seasons and the vigour of its hybrids, the new variety should prove useful in breeding.

2342 KUDEJAROV, N. I. & SMERTKIN, V. D.
(An experiment by seed producers in Krasnodar).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 9 : 15–20. [Russian].

A description is given of the heterotic cucumber Hybrid 221 (Posrednik 97Ž [Intermediary 97Ž] ♀ x Rustom 96–1 ♂).

2343 UCHIKAWA, I.
Karyological studies of Cucurbitaceae. IV. Cytogenetic studies of Japanese cucumber *Cucumis sativus* L. and its tetraploid induced by colchicine.
Mem. Ehime Univ. : Ser. 2B : 1956 : **2** : 229–38.

Meiosis in colchicine-induced tetraploid strains of two Japanese varieties is described. Meiosis was irregular and fertility low.

2344 ITO, H. & SAITO, T.
(Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. VI. The effect of day length and night temperature on the various stages of development in the nursery).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 1–8. [Japanese].

Short days and low night-temperature favour the production of female flowers, the converse conditions promoting the formation of male flowers. If the growth cycle is divided into four 10-day periods, the conditions referred to are most effective if operative during the second and third 10-day periods. [Cf. 999].

2345 RODNIKOV, N. P.
(The research at the Chair of Horticulture and the Horticultural Research Station of the Timirjazev Agricultural Academy).
Izv. Timirjazev sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : No. 4 : 131–42. [Russian].

This article mentions some new tomato varieties distinguished by earliness, high yield and tolerance of low temperatures. Some of these, such as Ijul'skij [July], were obtained by sexual, others by vegetative hybridization. The latter include Hybrids 53/82 and 47/17, both obtained by grafting germinating seed of the indeterminate tomato Bison on to the tubers of the potato Lorh. The graft hybrids and their sexual progeny differed from the scion variety in date of flowering and the shape of seeds and leaves, and had a determinate habit and round fruits weighing 70–80 g. each, with a reduced number of locules.

2346 THÉVENIN, L.
L'évolution de la culture de la tomate en Tunisie. **(The development of tomato cultivation in Tunisia).**
CR Acad. Agric. Fr. 1957 : **43** : 657–63.

In this survey, varieties which have been found most suitable for different methods of cultivation in Tunisia are listed. The aims of Tunisian tomato breeding and the methods used in testing varieties are briefly described.

2347 HLYSTOV, L. A.
(An experiment on growing hybrid seed of tomatoes).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 16–18. [Russian].

Mention is made of hybrid seed production from such crosses as Tamanec [tomato from Taman'] x Majak [Lighthouse], Odessa 071 x Majak and Tamanec x Odessa 071 in Moldavia. The seed from the first-mentioned cross showed heterosis for earliness and yield comparable with that of 10 x Bison introduced from Bulgaria. The total yield was just below that of 10 x Bison, but the fruit was larger.

2348 SAMSONOVA, I. A.
(Directing inheritance of characters in tomato hybrids).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 4 : 41–48. [Russian].

In pollinating varieties of *Lycopersicon esculentum* and *L. pyriforme*, *L. cerasiforme* and *L. pimpinellifolium* a slightly better set was obtained when some pollen of *Solanum nigrum* was added. In these crosses and in intervarietal crosses where the seed parent had certain recessive characters such as fasciation, determinate habit, broad leaves, yellow fruits or low number of locules, the proportion of plants in the F_1 and F_2 progeny possessing these recessive characters was greater when pollination was effected with small quantities of pollen from plants grown under very poor conditions, especially when pollen of *S. nigrum* was also added. The effect was less pronounced in the pollinations with *L. cerasiforme* than with *L.*

pyriforme, which is ascribed to the fact that *L. cerasiforme* is more wild and hence its hereditary constitution imposes itself more effectively on that of the maternal parent. Less effect again was obtained with *L. pimpinellifolium*, which is described as wilder still.

2349 STUBBE, H.

Mutanten der Kulturtomate *Lycopersicon esculentum* Miller I. (**Mutants of the cultivated tomato, *L. esculentum* Miller. I.**)

Kulturpflanze, Berlin 1957 : **5** : 190–220.

Dry seeds of the cultivars Lukullus, Condine Red and Rheinlands Ruhm [Rhineland Fame], which are described, after treatment with X-ray doses of 10–15 kr. gave rise to a large number of mutants, some of which are the subject of the present account. They are: *aegrota*, small with brown-black necrotic spots; *anantha*, with much-branched inflorescences and flowers reduced in development and fertility; *bracteata*, which forms the inflorescence after the 6th or 7th node and ripens four weeks earlier than the parent; *carinata*, dwarf and unbranched; *clara*, with yellowish leaves with purple veins, short in stature; *convalescens*, with light-green leaves; *debilis*, short with light green leaves with necrotic spots; *deformis*, short with deformed leaves; *deprimata*, short with dark-green leaves; *diluta*, short with light-green leaves; *elegans*, short with finely divided yellowish-green leaves; *eluta*, short with yellowish-green leaves with pigmented veins; *flavescens*, pale in colour, late in ripening; *fruticosa*, with bushy habit; *fulgens*, in which the chlorophyll content diminishes with increasing light intensity; *globosa*, short and bushy; *imbecilla*, short and pale green, with reduced length of internodes; *infirma*, dwarf and upright, with reduced branching; *invalida*, dwarf with reduced and deformed leaves; *jugata*, fasciated; *lata*, small with reduced internodes; *lucida*, short, light-green; *lutea*, small, yellowish-green; *marmorata*, slightly variegated; *multiflora*, with much-branched inflorescences and small fruits; *nana*, dwarf with reduced internodes; *neglecta*, small with reduced internodes and branching and necrotic leaves; *pallida*, light-green; *perviridis*, short and almost unbranched, dark-green with anthocyanin, large fruits ripening late; *procera*, with almost entire leaflets, pale-green in colour, and small fruits; *prunoidea*, tall with elongated internodes and fruits; *pumila*, small and almost unbranched, ripening late; *purilla*, dwarf and almost unbranched; *rava*, somewhat smaller than normal, greyish green; *robusta*^{crispata}, internodes thick and reduced in length, the plant being 35–50 cm. high and good in standing capacity, leaves crimped, dark green, fruits small and late in ripening; *robusta*^{immuna}, internodes somewhat reduced, short erect stature, dark green foliage; *rubescens*, pale green coloration of leaves and unripe fruits; *rustica*, short and upright, somewhat reduced internodes; *sitiens*, small with reduced branching and a tendency to wilt; *stricta*, upright, with somewhat reduced internodes; *subtilis*, 10–40 cm. high, upright with reduced branching and internode length, few fruits ripening late; *sufflava*, pale green; *tenuis*, 10–30 cm. high, pale green, almost unbranched, late in ripening; *tricuspis*, with elongated leaflets reduced in number, reduced number of fruits and seeds; *unicaulis*, small, upright, with reduced branching, pale green, early, good fruit set; *varia*^{decolorata}, small, pale green; *varia*^{virgata}, small, leaves with pale-green zones; *variabilis*, small, pale green, internodes somewhat reduced; *venosa*, small with reduced leaflets, pale green except when grown with deficiency of nutrients; and *viridis*, small and dark green.

2350 YAGU, P. & MORRIS, R.

Cytogenetic effects of X-rays and thermal neutrons on dormant tomato seeds.

Genetics 1957 : **42** : 222–38.

After treatment of tomato seeds with thermal neutrons, a linear relationship with dosage was obtained for anaphase bridges and fragments in root tip cells, reduction in leaf size and seedling mutations. In X-irradiated samples a linear relationship with dosage was obtained for anaphase bridges and seedling mutations but not for number of fragments or reduction in leaf size.

2351 MAKSAKOVA, V. M.

(**Utilizing an early tomato variety as a mentor for improvement of earliness**).

Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 14–16. [Russian].

F_1 hybrids of Štambovyj Karlik [Determinate Dwarf] x Birjučij Kut 20, grafted on the variety Štambovyj Karlik, gave a progeny characterized by greater earliness and improved yield, especially of first fruits.

2352 ANANJAN, A. A.

(**New tomato varieties obtained by means of vegetative and vegetative-sexual hybridization**).

Agrobiologija (Agrobiology) 1957 : No. 2 : 58–64. [Russian].

Hybrids 11v (Saharnyj 3055 [Sugar 3055] x Break o' Day)/Korotkostadijnyj 01 [Short-phased 01] and 235 (Guatemalan K 1000/Kuban' x Kuban') are being tested at Erevan pending their release. Both have a determinate habit and produce good-quality fruits with a high dry matter content.

2353 Vnučkova, V. A.
(Studying the seed progeny of a tomato grafted on *Cyphomandra*).
Agrobiologija (Agrobiology) 1957 : No. 2 : 49–57. [Russian].

The heritable basis of the tomato Golden was shattered by grafting it on *Cyphomandra* at Gorki Leninskie. The seed progeny of the scion included forms pertaining to *Lycopersicon esculentum* ssp. *pimpinellifolium.*

2354 Maksakova, V. M.
(The effect of ecological conditions upon seed progeny).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 7 : 22–23. [Russian].

The F_1 tomato hybrids of Štambovyj Karlik 01185 [Determinate Dwarf 01185] with Break o' Day 15 and Planovyj 904 [Plan 904] were raised in the Moscow and Rostov provinces and the F_2 grown at Moscow. It was found that the F_2 from Moscow was earlier and more productive than that from Rostov, but the latter had a higher dry matter content.

2355 Sinjakova, L. A.
(Change of certain characters in grafted tomatoes).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **30** : No. 3 : 278–87. [Russian].

The sugar content of the fruits of the tomato varieties Sliva Krasnaja [Red Plum] and Sliva Želtaja [Yellow Plum] was increased to different degrees when they were grafted on to *Solanum nigrum.* Grafting on to egg plants increased the sugar content in the former variety and reduced it in the latter, the differences being maintained in the seed progeny of the grafted plants; the grafted plants and their progenies had a higher proportion of sucrose to monosaccharides than the ungrafted controls.

Grafts on red pepper had a higher vitamin C content and grafts on potato or egg plant a lower content, these differences also being maintained in the seed progeny.

Similar differences are reported for characters such as acidity, dry matter content and catalase activity. Grafts on egg plant and the first and second seed generation were larger than the controls and had a larger number of fruits per plant whereas all others were smaller and had fewer fruits, the fruit size however being generally greater. Changes were observed also in the form of fruit and the number of locules, the changes being more pronounced in the second and third seed generations, fruits of different form being found within the same inflorescence. Grafting on *S. nigrum* and potato caused earlier and grafting on egg plant and pepper later maturity.

2356 Leung [Liang], S.-C.
(Report on the breeding of new tomato strains).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 209–10. [Chinese].

New varieties recently bred in China are described and illustrated, special attention being devoted to Wen-shih-hung [Greenhouse Red], with large fruits, thick flesh and good flavour, and Shai-chin-hung [Golden-sprinkled Red], in which the fruits are red with yellow spots.

Some experiments on vegetative and sexual hybridization along the usual Mičurinist lines are also reported.

2357 Wagner, W.
Zum Bestäubungsvorgang bei der Kulturtomate (*Lycopersicum esculentum* Mill.). **[On pollination in the cultivated tomato (*L. esculentum* Mill.)].**
Diss. Landw. Hochsch. Hohenheim 1956 : Pp. 82. (Mimeographed).

In nine of the ten varieties studied, self pollination appeared to be effected through the influence of gravity, when the flower was hanging down in its mature state. Parthenocarpy was found to be fairly frequent; it occurs more readily under greenhouse conditions than in the open air.

2358 Bravenboer, L.
Nieuwe mogelijkheden voor het enten van groentegewassen onder glas. **(New possibilities for grafting vegetable crops grown under glass).**
Meded. Dir. Tuinb. 1957 : **20** : 707–13.

The F_1 hybrid *Lycopersicon esculentum* x *L. hirsutum* var. *glabratum,* which is vigorous and resistant to corky root, produced good yields when used as a rootstock for tomato. Other species and varieties of *Lycopersicon* and *Solanum* were resistant to *Verticillium* wilt and *Meloidogyne* but were unsatisfactory as rootstocks for tomato.

2359 ALPAT'EV, A. V. & ERINA, O. I.
(Methods of breeding cold-resistant tomatoes).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 3 : 17–26. [Russian].

A number of early, high-yielding tomatoes tolerant of —7° C. frost were bred at Gribovo. They were obtained by Mičurinist methods such as intravarietal crossing of forms grown in different environments, vernalization at alternating temperatures, hardening in open ground, training upon rich soil and continuous selection. The best newly bred forms included a hybrid obtained by intercrossing F_1 progenies of F_3 Gruntovoj Desertnyj [Outdoor Dessert] x Skorospelyj Havskij 42 [Early Hava 42] which had been grown in different environments. This hybrid exceeded all others in earliness, yield and cold resistance. Other new material, possessing similar characteristics to the above hybrid, was obtained by intercrossing (1) F_1 progenies of F_3 Patriot x Skorospelyj Havskij 42 and (2) F_1 progenies of (F_1 Štambovyj [Determinate] x Planovyj [Plan] x Štambovyj Alpat'eva [Aplat'ev's Determinate] x Štambovyj Gribovskij [Determinate Gribovo]) x Stalingrad 5/95.

2360 DROZD, A. M.
(The tomato variety Pervenec 190).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : p. 95. [Russian].

Pervenec 190 [First-born 190] (Break o' Day x Ljubimec Kolhoza [Kolhoz Favourite]) was bred at Krymskaja, Krasnodar territory. It outyields Majak [Light-house], Bison and Skorospelyj Volžskij [Volga Early] in a number of districts. The fruit is smaller than that of Bison but of superior flavour and larger than that of Majak. It shows resistance to drought and moderate resistance to big bud.

2361 ÅKESSON, H.
Skandinaviska tomatförsök 1955–1957. **(Scandinavian tomato trials, 1955-1957).**
Weibulls Allehanda 1957 : No. 2 : 33–41.

In trials of (*a*) 13 varieties at Weibullsholm, Sweden in 1957, (*b*) seven varieties at Virum, Denmark, in 1955–56, (*c*) nine varieties at Kvithamar, Norway, in 1955 and (*d*) five varieties in various localities in Norway in 1956, Immuna/56 gave the highest early yield and, except in trials (*c*), the highest total yield. Ware Cross, which also gave high early and total yields in the trials in which it participated, yielded a high proportion of top-quality tomatoes.

2362 ANDRONICESCU, D., BUNESCU, D., GEORGESCU, M., VOINEA, M. & AVRAMESCU, AL.
Contribuţii la raionarea soiurilor de tomate în R.P.R. **(Contributions to the regionalization of tomato varieties in the Rumanian People's Republic).**
Anal. Inst. Cerc. agron. Romîn. 1956 (1957) : **24** : 349–68.

Data are provided on the fruit production of an extensive series of local and introduced forms and recommendations are made of varieties suitable for different regions in Rumania.

2363 SOLTANOVSKAJA, G. A.
(The egg-plant variety Simferopol' 105).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 10 : p. 95. [Russian].

This new variety from Simferopol' in the Crimea is distinguished mainly by high quality and productiveness. It yields up to 250 c. per ha. and the fruit weighs 300–700 g. The flavour and keeping properties are good.

2364 YEN, D. E.
A shiny-podded mutant in pole bean. (*Phaseolus vulgaris* L.).
NZ J. Sci. Tech. 1957 : **38** : 820–24.

The above mutant occurred spontaneously at Auckland, New Zealand, in the variety Fardenlose. Inheritance studies indicate that the shiny podded character is determined by a single gene, designated *ace*, and that it is not linked with rust resistance.

2365 MARCANO COELLO, L. & LINARES S., P. J.
"Cubagua" nueva variedad de caraota negra (*Phaseolus vulgaris*). **[Cubagua, a new variety of black bean (*Ph. vulgaris*)].**
Agron. trop., Venezuela 1956 : **6** : 27–30.

Cubagua, a selection from local material obtained at the Caracas market, has an erect, relatively little branched habit, and pods 8 cm. long situated high on the plant and containing 5–7 small black seeds per pod. These characters and its uniform ripening render it specially suitable for mechanical cultivation and harvesting. Its average yield over several localities in 1953 and 1954 was 689 kg./ha.

2366 MARCANO COELLO, L. & LINARES S., P. J.
"Margarita" nueva variedad de caraota negra (*Phaseolus vulgaris*). [**Margarita, a new variety of black bean (*Ph. vulgaris*)**].
Agron. trop. Venezuela 1956 : **6** : 31–33.

Selected from material collected in Aragua, Margarita is branched and vigorous with pods 10 cm. long containing 6–7 small black beans, situated high on the plant. It is recommended for intensive cultivation, alone or together with other crops. In tests at a number of stations in 1953 and 1954, average yields were 703·5 kg./ha.

2367 HUBBELING, N.
New aspects of breeding for disease resistance in beans (*Phaseolus vulgaris* L.).
Euphytica, Wageningen 1957 : **6** : 111–41.

A detailed survey is provided of methods available in the Netherlands for testing beans for reaction in the field and greenhouse to the following: common bean mosaic and black root (*Phaseolus* virus 1); yellow bean mosaic and apical necrosis (*Phaseolus* virus 2); stipple streak (*Nicotiana* virus 11); halo blight (*Pseudomonas phaseolicola*); and anthracnose (*Colletotrichum lindemuthianum*). Reference is also made to field testing for resistance to rust (*Uromyces phaseoli*). The methods described are those recommended by the Institute of Phytopathological Research, Wageningen, in its capacity of advising private breeders in the Netherlands and supplying them with infection material. The results of testing many horticultural varieties of *Ph. vulgaris*, some runner-bean varieties, Lima bean and seven wild species and forms as sources of resistance to the abovementioned diseases are also summarized, together with comments on past results and present potentialities of breeding in which some of these varieties and species have been utilized. Of the wild material, it has so far only been possible to use *Ph. dumosus* in hybridization [cf. XXVI, 1894]. Finally, against the background of information already reported on the genetics of resistance, the author describes methods for the development of varieties combining resistance to several diseases, by selection of hybrids in the F_2 and subsequent generations and by intercrossing F_5 and F_6 lines supplementary to one another in resistance to diseases. It is estimated that development of a variety with resistance to all six pathogens would entail the combination of about 20 appropriate genes.

2368 COREY, R. R. & STARR, M. P.
Colony types of *Xanthomonas phaseoli.*
J. Bact. 1957 : **74** : 137–40.

COREY, R. R. & STARR, M. P.
Genetic transformation of colony type in *X. phaseoli.*
Ibid. 1957 : **74** : 141–45.

COREY, R. R. & STARR, M. P.
Genetic transformation of streptomycin resistance in *X. phaseoli.*
Ibid. 1957 : **74** : 146–50.

In the first of these contributions the morphological and pathological characteristics of four colony types of *X. phaseoli* are described. Differences in size, morphology and host symptoms appear to be directly correlated with polysaccharide production. The second paper describes the interconversion of these four types by transformation with DNA and it is suggested that the genetic control of the quantity of polysaccharide produced may be explained by assuming that three functional genes, each with a nonfunctional allele, govern the production of polysaccharide, the quantity being dependent on the number of functional genes present. In the third paper the transformation of streptomycin-sensitive cells to streptomycin resistance by DNA is described.

2369 BOCANEGRA S., S. & SÁNCHEZ A., J. L.
Resistencia a las enfermedades del frijol más comunes en la Costa Central. Campaña 1956. (**Resistance to the most common bean diseases in the Costa Central. Season 1956).**
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 361 : 11–14.

In preliminary tests of 156 varieties, the beans Cau.31, US10, Ven.68, Ven.73 and Ven.76 were the most resistant to *Erysiphe polygoni* and are expected to be of use in breeding.

2370 THEIS, T., CALPOUZOS, L. & CABANILLAS, E.
The rust reaction of Tropic Wonder and several other pole beans for the tropics.
Plant Dis. Reptr. 1957 : **41** : p. 884.

Greenhouse tests in Mayagüez, Puerto Rico, showed that Tropic Wonder and Bonita are susceptible to *Uromyces phaseoli* var. *typica*; Hawaiian Wonder and Lualualei may be resistant to the races of bean rust present in Puerto Rico but this needs further checking.

2371 Korohoda, J. & Szmidt, O.
Przyczynek do badań nad fasolą szparagową. (**Contribution to studies of snap beans**).
Roczn. Nauk rol. : Ser. A : 1957 : **76** : 369–403.

Of 62 Polish and introduced varieties of dwarf snap beans tested at the Smolice Experimental Station, Poland, during 1952–54, 43 varieties were found suitable for canning or immediate consumption. Details of yield, habit, pod and seed characters, vegetative period and disease resistance are presented for each of the 43 varieties.

2372 Sortsforsøg med lave voksbønner 1952–55. (**Varietal trials of dwarf wax beans, 1952-55**).
Tidsskr. Planteavl 1957 : **61** : 545–46.

Information on the yields and quality of 11 varieties tested at three stations in Denmark is presented.

2373 Marcano Coello, L. & Linares S., P. J.
"Orinoco", nueva variedad de frijol blanco (*Vigna sinensis*). [**Orinoco, a new variety of white cowpea** (***V. sinensis***)].
Agron. trop., Venezuela 1956 : **6** : 87–90.

Marcano Coello, L. & Linares S., P. J.
"Arauca", nueva variedad de frijol bayo (*Vigna sinensis*). [**Arauca, a new variety of brown cowpea** (***V. sinensis***)].
Ibid. 1956 : **6** : 91–94.

Marcano Coello, L. & Linares S., P. J.
"Caroní", nueva variedad de frijol rojo (*Vigna sinensis*). [**Caroní, a new variety of red cowpea** (***V. sinensis***)].
Ibid. 1956 : **6** : 95–97.

The semierect habit of the first of the above varieties and the erect habit of the other two, together with the uniformity of growth and maturity shown by each, render all three varieties suitable for mechanical harvesting. Orinoco, which has white seeds with a brown eye, was selected from local material from Zaraza, Guárico State, and has given an average yield of 1055 kg./ha. Arauca, selected from material obtained at Caracas market, Federal District, has reddish brown seeds and has yielded 1098 kg./ha. The red-seeded variety Caroní, yielding 1012 kg./ha., is a selection from local material from Corocote, Yaracuy State.

2374 Johnson, H. W.
Soybean breeding research. Recent developments, future objectives.
Soybean Dig. 1957 : **17** : No. 11 : 60–62.

Breeding soya beans for disease resistance is being intensified in the USA. In recent years *Phytophthora* root rot, "soybean cyst nematode," a virus occurring in several states and a chlorosis influenced by certain strains of nodulating bacteria have become important problems; sources of resistance have however been discovered. Breeding for improvements in other characters such as oil content, yield, resistance to lodging and shattering and adaptability to combine harvesting continues. In order to satisfy the current requirements of the processing industry, breeders are laying more emphasis on high oil content than increased protein.

2375 Horner, T. W. & Weber, C. R.
Theoretical and experimental study of self fertilized populations.
Biometrics 1956 : **12** : 404–14.

Observations on maturity were made for the F_2–F_7 of a soya-bean cross. The main part of the paper is devoted to a method of determining the expectation of the sample covariance of one generation with another, in terms of the quantities cov(k; n,m), being the genotypic covariance of progenies in the n^{th} generation from particular genotypes in the k^{th} generation with progenies in the m^{th} generation from those same genotypes of the k^{th} generation. These quantities can then easily be expressed in terms of σ^2_A, σ^2_D and σ^2_{AA}, if an additive model with dominance with additive x additive interaction, two alleles per locus, no linkage and a gene frequency of one-half is assumed. It is found that the completely additive model ($\sigma^2_D = \sigma^2_{AA} = 0$) fits the data as well as the two more complex models and accounts for 96% of the variation in the dependent variable. No genotype x year interaction is allowed for.

2376 Lu, Y.-C. & Tsai, K.-H.
(**Experiments on the sowing dates for soya-bean varieties**).
Nung-lin-hsueh Pao/J. Agric. For., Taichung 1956 : **5** : 16–38. [Chinese].

The behaviour of a large series of Chinese, Japanese and American varieties following on a wide range of sowing dates in Taiwan is described. The varieties could, in general, be grouped into two categories: (1) those more suitable for spring sowing and (2) those more suitable for summer or autumn sowing.

2377 Howell, R. W. & Collins, F. I.
Factors affecting linolenic and linoleic acid content of soybean oil.
Agron. J. 1957 : **49** : 593–97.

Varietal differences in the linolenic and linoleic acid content of soya beans are reported.

2378 Weber, C. R.
Selection for yield in bulk hybrid soybean populations with different plant spacings.
Agron. J. 1957 : **49** : 547–48.

Single plants were selected for a time of maturity similar to that of Hawkeye and for yield in (1) three bulk F_6 intervarietal crosses and (2) bulk F_3 crosses from another set of three intervarietal crosses, in sowings with three different spacings within the row, viz. drilled (about 1 in. spacing), 4 in. and 8 in. All rows were 40 in. apart and 20 plants were chosen among the 500 plants representing each cross. The progenies of selections from (1) and (2) were tested in replicated drilled plantings in the F_8 and F_5, respectively. Combining the results of the two tests, the means calculated indicated that spacing in the generation selected had no significant influence on (*a*) yield per acre, with or without the adjustment for maturity necessitated by the slightly later maturity shown by selections from drilled plantings, and (*b*) height and lodging. Individual-plant yields were consistently greatest in 8 in., intermediate in 4 in. and least in drilled sowings; choice of spacing will therefore depend upon the quantity of seed desired by the breeder.

2379 Hildebrand, A. A.
A *Phytophthora* root and stalk rot of soybeans.
Proc. Canad. phytopath. Soc. 1957 : No. 25 : 14–15. (Abst.).

The variety Monroe is immune to a root and stalk rot occurring in south western Ontario; the pathogen is thought to be *Phytophthora megasperma*.

2380 Šul'ga, P. M.
(Utilizing vegetative hybridization in breeding and seed production of peas).
Agrobiologija (Agrobiology) 1957 : No. 3 : 136–38. [Russian].

An account of experiments at Uladovo-Ljulinec, where peas were grafted on other peas or on *Vicia faba*, is given and heritable changes which occurred in morphological and biological properties are described. Some hybrids had larger pods and seeds than the scion, others ripened earlier or had a habit suitable for combine harvesting. Several selected families showed improvements in yield as compared with the standards Uladovo 303 and Victoria Mahndorf. The most productive among them were those from the vegetative hybrid Uladovo 208 pea/Fioletovyj [Mauve] broad bean and Uladovo 387 pea/Uladovo 208 pea.

2381 Temkin, V. I.
(An experiment on vegetative hybridization of peas).
Agrobiologija (Agrobiology) 1957 : No. 2 : 65–69. [Russian].

Heritable changes obtained in the varieties 109 and Torsdag by graft hybridization at Jaroslavl' are described. The seed progeny of hybrid 3 (109/Torsdag) had larger and thicker pods than the components of the graft, and green seed, with the same shape as in Torsdag but larger. The progeny of hybrid 1 (Torsdag/a large-seeded form of *Pisum arvense* from Abyssinia) outyielded Torsdag, ripened 9 days earlier and produced larger seed.

2382 Jebrak [Žebrak], A. R.
Natura altoirilor la plantele superioare. **(The nature of grafts in higher plants).**
An. Romîno-Soviet. : Ser. Biol. 1957 : No. 1 : 122–39.

The Russian paper of which this is a translation has been referred to already [XXVII, 3595].

2383 Vasileva-Drjanovska, O. A.
(Cytological and embryological investigation of multiparental pollination in peas).
Izv. bot. Inst., Sofija 1955 : **4** : 127–83.

An extended account of a report previously summarized [XXIV, 3490] is given.

2384 Svalöfs Belloärt—en ny högt avkastande foderärt. **(The Svalöf pea Bello, a new high-yielding fodder pea).**
Allmänna Svenska Utsädesaktiebolaget, Svalöf (General Swedish Seed Co. Ltd., Svalöf) 1958 : 35–36.

Bello, developed from Hero x Artturi, exceeds the comparable variety Brio, which ripens a day earlier, in yield of seed and straw and has a lower 1000-seed weight.

2385 Andeweg, J. M. & van Kooten, A.
The practical importance of an identification of garden pea varieties in the seedling stage.
Euphytica, Wageningen 1957 : **6** : 237–41.

"Shadowgraphs" of the first two leaves of the seedlings have proved to be useful in the identification of numerous pea varieties studied at the Institute of Horticultural Plant Breeding, Wageningen, Netherlands. Comparison of the shadowgraphs is however only reliable if the temperature conditions under which the seedlings are raised are as similar as possible. Admixture in commercial seed may also be detected by this means, identification of the component varieties usually being possible.

2386 LAMM, R.
Three new genes in *Pisum*.
Hereditas, Lund 1957 : **43** : 541–48.

The gene pair *Lat lat* is responsible for the normal condition *vs.* very broad stipules, leaflets and pods, while *Was was* causes waxy vs. waxless plants. The effects of both pairs are easily recognized in the seedling stage. The two loci have been assigned to the *N–Fa* linkage group, their order in relation to *N* being *Lat*–(10·2 ± 5·23%)–*N*–(19·4 ± 2·38%)–*Was*. In linkage analysis *was* is a suitable substitute for *fa*. With the discovery of a third gene (tl^{pet}) at the *Tl* locus, a new case of multiple allelism has come to light. The gene for the "acacia" type of leaf with short petiolules, first described by O. E. White thirty years ago, has been designated tl^{W}. The allele tl^{pet} results in leaves of the acacia type with long petiolules. *Tl* for normal leaves with tendrils and tl^{W} are completely dominant to tl^{pet} but the dominance of *Tl* over tl^{W} is only partial.

2387 POLUNIN, JA. JA.
(A vegetative pea hybrid, Urožajnyj 51).
Agrobiologija (Agrobiology) 1957 : No. 3 : 99–104. [Russian].

Urožajnyj 51 [Productive 51] was obtained by grafting Štambovyj Mozgovoj [Crown-type Marrow-fat] on Lord Robert at Moscow Horticultural Station. It outyields Štambovyj Mozgovoj and the sexual hybrid between the varieties used in the graft. It is superior to Štambovyj Mozgovoj for canning since it ripens more uniformly, has larger seed and shows less damage on shelling.

2388 Sortsforsøg med skalærter. 1953–55. **(Varietal trials of shelling peas. 1953-1955).**
Tidsskr. Planteavl 1957 : **61** : 547–48.

Details of yield, seed colour and flavour of 14 varieties tested at four stations in Denmark are given. The earliest varieties were lowest in quality.

2389 MIHOV, A.
(Trials of Soviet pea varieties for culinary uses in the People's Republic of Bulgaria).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 6 : 32–33. [Russian].

Rannij Mozgovoj 14 [Early Marrow-fat 14], characterized by earliness, high yield and good canning properties, was found to be suitable for cultivation in most districts. Štambovoj Mozgovoj 3–31 [Crown-type Marrow-fat 3–31] was productive in areas with a cool moist climate. The canning quality was good.

2390 WALLEN, V. R.
The identification and distribution of physiologic races of *Ascochyta pisi* Lib. in Canada.
Canad. J. Pl. Sci. 1957 : **37** : 337–41.

Using the pea varieties Wisconsin Early Sweet, Arthur, Engress, Profusion, Kelvedon Wonder, Smallton and Valley as differentials, four races (I–IV) of *A. pisi* were identified among 80 isolates obtained from diseased pea plants and seeds in six provinces in Canada. Each race has a geographically limited distribution. Races I and II were only weakly pathogenic. Race III, occurring in central and western Ontario, was extremely pathogenic, attacking all the varieties. Race IV, predominant in eastern Ontario but also found to a lesser extent in central and eastern Ontario, Quebec and Nova Scotia, attacked all varieties except Kelvedon Wonder.

2391 QUANTZ, L.
Über das Auftreten des Gurkenmosaikvirus auf Erbsen. **(On the occurrence of the cucumber mosaic virus on peas).**
Angew. Bot. 1957 : **31** : 166–73.

The occurrence of the above virus on peas in Western Germany has been established. So far, none of the 50 varieties tested has proved resistant although some showed a less severe reaction type than others.

2392 K., L.
Verslag peulenrassenproef 1957 Paterswolde. **(Report of sugar-pea varietal trial at Paterswolde in 1957).**
Tuinbouwber., Groningen 1957 : **12** : p. 207.

The new variety Vliesloos [Membraneless], released by the National Horticultural Advisory Service in Amsterdam, has exceeded Heraut in yield and is a week later.

2393 Patil, J. A. & Chaudhari, B. B.
A ‘pod mutant’ in gram (*Cicer arietinum* Linn.)
Curr. Sci. 1957 : **26** : p. 250.

This mutant arose spontaneously at the Agricultural Station, Niphad; it has bred true for six years. The pods lie on the leaves instead of hanging down as in the normal type.

2394 Generalov, J. F.
(The lentil—on to the fields!)
Nauk. pered. Opyt sel’sk. Hozjajstv. 1957 : No. 10 : 35–36. [Russian].

Soviet standard varieties of lentil, mostly mid-season types with high yield and large green seed and resistance to diseases, are described. Some are improved cultivars, others land varieties. The 1000-seed weight of the former is 50–70 g. and that of the latter, including the early ripening Tajik 95, 24–45 g.

2395 Patil, J. A. & Sheikh, Y. N.
Short stigma off type plant in pigeon pea (*Cajanus cajan* Millsp.).
Curr. Sci. 1957 : **26** : 253–54.

At the Agricultural Station, Niphad, a plant of the strain N282–7 was found to have stigmas which remained below the anthers instead of lying above them. No seed has been obtained by either open or self pollination.

2396 **New corn promising.**
Canad. Grain J. 1957 : **13** : No. 9 : p. 28.

Selected at the Canada Department of Agriculture Experimental Farm at Caplan, Quebec, from a short-stalked flint line of unknown origin, Gaspé Flint has shown promise for use in breeding garden varieties of sweet corn for use in areas with short, cool seasons by reason of its extreme earliness, tassels appearing only 24 days after seedling emergence.

2397 Kadinopoulos, C. D.
Influence of pollen parent upon the development of pericarp in sweet corn (*Zea mays saccharata*).
Diss. Abstr. 1957 : **17** : Publ. No. 21,479 : 1180–81.

In outcrosses of inbred lines to lines differing substantially in pericarp thickness, the pollen parent influenced the rate of development of the pericarp of the hybrid kernels but did not affect its final structure. In an experiment on the influence of delayed pollination on seed set and the final structure of the pericarp, maximum seed set was obtained three days after silk emergence. The earlier the variety, the sooner was receptivity lost. Delay of pollination up to the fifteenth day after silk emergence had no effect upon the final structure of the pericarp.

2398 Cox, R. S. & Van Nostran, F. E.
A high-temperature tolerant strain of *Helminthosporium turcicum*.
Plant Dis. Reptr. 1957 : **41** : 796–97.

A race of *H. turcicum* tolerant of high temperature has arisen on sweet corn in Florida. The possible significance of such variability in breeding is briefly considered.

2399 Grogan, C. O. & Zuber, M. S.
Missouri hybrid popcorn yield trials 1955.
Bull. Mo. agric. Exp. Sta. 1956 : No. 671 : unpaginated.

The yellow hybrids Iopop 6, Purdue 31, Purdue 22 and Purdue 32 are recommended for general cultivation in Missouri. Several experimental hybrids from Indiana and Iowa were promising. The white hybrids were too low in yield and popping volume for any recommendations to be made for large-scale production. Iopop 5 and Iopop 7 are however suitable for domestic gardens.

2400 Tucakov, J.
Contribution à l’étude de quelques plantes aromatiques et huiles essentielles yougoslaves. **(A contribution to the study of some Yugoslavian aromatic plants and essential oils).**
Mater. veg. 1957 : **2** : 184–218.

At Belgrade University selection is proceeding with the mint variety Mitcham; a biotype adapted to Yugoslavian conditions has been produced. It was found that a type of *Coriandrum sativum* with small seeds produces more essential oil than the type with large seeds.

2401 Ikeda, N., Udo, S. & Kishimoto, O.
(Studies on mint breeding. VII. Cytogenetical studies on the F_1 between Japanese mint and *Mentha rotundifolia* (L.) Hud.).
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1956 : No. 8 : 62–68. [Japanese].

The chromosome numbers of the above mints are 96 and 24 respectively. The F_1 hybrid, which more closely resembles Japanese mint, has 60 chromosomes; the number of bivalents is 2–10_{II} with the mode at 6_{II}, all the other chromosomes appearing as univalents. It is inferred that the genome of *M. rotundifolia* is partially homologous with one of the genomes of Japanese mint. [Cf. XXVII, 3610].

2402 IKEDA, N. & UDO, S.
(Studies on mint breeding. VIII. Studies on the yield and characteristics of the essential oil of interspecific mint hybrids).
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1957 : No. 10 : 43–50. [Japanese].

The hybrids studied were Japanese mint x the pilose form of *Mentha spicata* and Japanese mint x *M. spicata* var. *crispa*. They exceeded Japanese mint in plant yield and resistance to drought and rust; some F_1 combinations equalled Japanese mint in essential-oil content. Most of the hybrids had 25–50% of unsaturated ketones in their essential oils and consequently an unsatisfactory aroma. Two hybrids from combinations involving var. *crispa*, however, had a low percentage of unsaturated ketones and are regarded as especially promising.

ECONOMIC LOWER PLANTS

2403 STEEL, R. & WALKER, T. K.
Celluloseless mutants of certain *Acetobacter* species.
J. gen. Microbiol. 1957 : **17** : 12–18.

Mutants which do not produce extracellular cellulose were obtained in two strains of *A. acetigenum* (NCIB8132, NCIB5346) and in one strain of *A. xylinum* var. *africanum* grown under various cultural conditions.

2404 STEEL, R. & WALKER, T. K.
A comparative study of cellulose-producing cultures and celluloseless mutants of certain *Acetobacter* spp.
J. gen. Microbiol. 1957 : **17** : 445–52.

Morphological and physiological differences are described between two strains of *A. acetigenum*, one strain of *A. xylinum* var. *africanum* and a total of 26 celluloseless mutants obtained from these three parent cultures.

2405 EROHINA, L. I. & ALIHANJAN, S. I.
[The effect of photoreactivation upon the mutation process of a streptomycin producer *Str. griseus* (*Act. globisporus streptomycini*)].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1956 : **111** : 703–05. [Russian].

The lethal effect of high doses of ultraviolet radiation upon a strain of *Streptomyces griseus* was reduced by photoreactivation. Doses of up to 4000 erg/mm.^{2} increased appreciably the frequency of mutations controlling the production of streptomycin.

2406 CIEGLER, A.
Heterokaryons of *Aspergillus* and their application in selected fermentations.
Diss. Abstr. 1957 : **17** : Publ. No. 18,388 : p. 214.

Heterocaryons were obtained by pairing colour and morphological mutants of *Aspergillus*, chief use being made of mutants of *A. fonsecaeus* 'NRRL67', a strain forming large, black, multinucleate conidia and capable of giving good yields of either citric or gluconic acid. Analysis of the vegetative growth developed during fermentation revealed a high ratio of segregated component mutants to the heterocaryon itself. Various procedures designed to stabilize the heterocaryons were unsuccessful. It was also found that (1) when two high acid-producing strains were combined, the heterocaryon yielded less acid than either parent, (2) when high and low acid-producing strains were paired, the resulting heterocaryon was intermediate in acid formation, and (3) the heterocaryon arising from two low-yielding strains gave a yield exceeding that of either parent. In all combinations the heterocaryons grew more rapidly than both parents. It is suggested that if the yield potential of a culture is low by virtue of its limited growth, incorporation in a heterocaryon offers a means of enhancing productivity.

2407 SERMONTI, G.
Analysis of vegetative segregation and recombination in *Penicillium chrysogenum*.
Genetics 1957 : **42** : 433–43.

An analysis of vegetative segregation in three heterozygous diploid strains of *P. chrysogenum* has given results which fit the model of vegetative segregation in *Aspergillus nidulans* [cf. XXIV, 1664]. Two mitotic linkage groups have been identified and the sequence of a number of genes determined.

2408 GILLILAND, R. B.
Biology of yeast.
Nature, Lond. 1957 : **180** : 1161–63.

Papers read at a joint session held on the above subject by the Chemistry and Botany Sections of the British Association at Dublin on 9 September 1957 are summarized. D. G. Catcheside opened the discussion with a paper giving a general survey on The genetics of yeasts. The contributions also included Yeast biology in relation to fermentation techniques by R. B. Gilliland; among the aspects considered were the possible commercial value of hybrid strains and tetraploids and the genetical control of fermenting abilities and flocculation.

2409 Parks, L. W. & Douglas, H. C.
A genetic and biochemical analysis of mutants to tryptophan independence in Saccharomyces.
Genetics 1957 : **42** : 283–88.

Tryptophane-independent clones arising spontaneously in *tr–1* haploid *Saccharomyces* were found in most cases to be suppressed mutants. Clones of *tr–1* are unable to convert anthranilic acid to indole but the suppressor gene *tr–1–su* effects a partial restoration of the blocked reaction in *tr–1* clones though not in *tr–2* clones.

2410 Wright, R. E. & Lederberg, J.
Extranuclear transmission in yeast heterokaryons.
Proc. nat. Acad. Sci. USA 1957 : **43** : 919–23.

"Fowell's interpretation that parental-type buds from mating pairs in a strain of *S. cerevisiae* var. *ellipsoideus* arise from transient heterokaryons has been confirmed. In a series of experiments with doubly and triply marked stocks, carrying markers which were not closely linked, no unequivocal case of recombination was found.

"Progeny of isolated heterokaryons include clones of the parental genotype which show a change in respiratory phenotype. The latter therefore appears to be subject to extranuclear transmission, in accord with the conclusion of Ephrussi *et al.*" [Authors' summary].

2411 Fang, H.-F., Tsai, C.-K. & Kuan, S.-M.
(**Studies on directed changes in yeast. II. The rearing of yeasts tolerant of sodium fluoride**).
Chi-wu-hsueh Pao/Act. bot. sinica 1957 : **6** : 1–6. [Chinese].

By culturing yeast on media containing progressively more NaF, strains tolerant of a concentration of 0·06% have been obtained. It is believed that the strains arose by adaptive response and not by selection of preadapted genotypes.

2412 Socías, A. & Ramírez, C.
Estudio cariológico de algunas levaduras ascosporógenas y anascosporógenas. (**Caryological study of some ascosporogenous and anascosporogenous yeasts**).
Microbiol. esp. 1955 : **8** : 389–417.

Studies of species of *Endomyces*, *Saccharomyces*, *Torulopsis*, *Nadsonia* and *Saccharomycodes* showed that all had a compact nucleus reacting positively to Feulgen and Giemsa-Robinow stains. The nature of nuclear division could not be established but seemed to show both mitotic and amitotic features.

2413 Catalano, M.
La flora blastomicetica dei mosti pugliesi. Prove di fementazioni su scala semi-industriale con ceppi selezionati. (**The yeast flora of the musts of Puglia. Fermentation tests on a semi-industrial scale with selected strains**).
Ann. Fac. Agr. Bari 1957 : **11** : 395–425.

Data are given on the yeast flora of vine musts in the Puglia and adjacent provinces in southern Italy. The coefficient of conversion of sugar to alcohol varied from 0·547 to 0·624, wide variation being observed between strains of the same species; 9 of the strains combined good fermentive capacity with high production of neutral esters and medium glycerine production and were used in fermentation trials; all the wines produced from them had a higher alcohol content than those produced from unselected strains; although the season in which they were tested was one in which the natural wines were good in quality, those from the selected strains were classed as better.

BOOK REVIEWS

2414 Bonnier, G. & Tedin, O.
Biologisk variationsanalys. (**Analysis of variation in biology**).
Scandinavian University Books, Stockholm 1957 : 2nd ed. : Pp. x + 186 : figs. : tables.

This book, which first appeared in 1940, is well known as an elementary text book in Scandinavia. This new edition has been extensively revised and somewhat reduced; the chapter on elementary mathematics has been omitted as have also the sections on binomial and Poisson distributions and the account of Latin squares. What remains is a clear and concise treatment of analysis of variation. After the first introductory chapters on the mean, the population concept and probability, there follow chapters on the comparison of two sets of measurements, normal distribution, comparisons between empirical and calculated frequency distributions, hierarchical treatment of data, three chapters on interaction and heterogeneity in variance analysis and three final chapters on regression and correlation, probit analysis and the estimation of variances. Each chapter includes worked examples of the types of problems encountered, and several of the chapters conclude with sections on the derivation of formulae. Some 25 pages of tables and a short index complete the book. This lucidly written and well produced book will certainly continue to be much used by Scandinavian workers and it is a pity that a short work of this kind, in which much is necessarily omitted, should contain no bibliography or guide to more detailed treatments.

2415 ALTENBURG, E.
Genetics.
Constable & Co. Ltd., London 1957 : Rev. Ed. : 42s. 6d. : Pp. xv + 496 : figs. : tables.

This is the English edition of a work already published in America and reviewed in these pages [cf. 1073]. The eye-catching binding of the American edition has been replaced by one conforming to the more sober English taste in book design, but the text and figures remain identical down to the last comma and chromosome. Unfortunately printer's errors have also been retained: in the preface to both editions, Sir Ronald A. Fisher is referred to as Sir Donald A. Fisher.

2416 MÜNTZING, A.
Vererbungslehre. Methoden und Resultate. (**Genetics. Methods and results**).
Gustav Fischer Verlag, Stuttgart 1958 : DM 42 : Pp. xi + 303 : 194 figs. : tables.

Professor Müntzing's text book on genetics [cf. XXV, p. 100] now appears in a German edition. The text has been elegantly translated by D. von Wettstein, who has occasionally used different examples to illustrate phenomena such as pleiotropy, sex-linked inheritance or cytoplasmic differences, but otherwise adheres faithfully to the Swedish original. Some of the figures have been improved by substitution of better illustrations and the general quality of the illustrations is considerably higher than in the Swedish edition. The list of references has been changed completely and now consists of three sets of references to standard works, in German and English, on general genetics and cytology, applied genetics, and human inheritance. A brief list of some of the main periodicals dealing with genetics has been added and greater care has been devoted to the index, which now comprises both author and subject entries.

2417 KEMPTHORNE, O.
An introduction to genetic statistics.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1957 : 102s. : Pp. xvii + 545 : figs. : tables.

It is always important in fields where mathematics is being applied to a complex situation for the details of the mathematical argumentation to be accessible to those with first-hand knowledge of the data concerned. This is because mathematical rigour cannot justify the preliminary assumptions and simplifications that are almost invariably made when treating an intricate problem mathematically and cannot guarantee that the physical or biological significance of the mathematical terms is kept invariant during the application.

In a book remarkable for brilliant exposition, Professor Kempthorne provides an entry for biologists into mathematical genetics, demanding little more from the reader than a knowledge of algebra and a little elementary calculus. The topics covered include a general exposition of probability, gene frequencies in panmictic populations, selection, elementary stochastic theory of genetic populations, inbreeding, tests of genetic hypotheses, estimation of genetic parameters, partitioning of variance, multiple regression, path analysis, quantitative inheritance in panmictic and inbred populations, correlation between relatives and population equilibrium. A consistent effort is made throughout the book to accommodate the text to readers with elementary mathematics only, and in cases where more specialized mathematics is required, for example matrix algebra in the treatment of inbreeding, the methods are clearly explained.

One of the major difficulties in assimilating the literature on population genetics arises from the divergent notational devices, and sometimes different initial assumptions, of the principal writers. Professor Kempthorne performs a great service in bringing into alignment the methods of such basic writers as Fisher, Wright, Haldane, Malécot, Lush, Mather, the Iowa school and Kimura. One result of this collation is to emphasize the number of solutions to problems in population genetics derived by Fisher as early as 1918 and only properly appreciated in recent years. The author expresses the hope "that a person who assimilates the contents of this book will be able to read with some facility the basic writings of Fisher, Wright, Haldane, and Malécot, and the current literature." This is too sanguine an expectation since the author himself confesses inability to follow at least one of Fisher's derivations. None the less, no one has done more to promote this ideal.

The author is not dogmatic on controversial issues and leaves such thorny matters as the evolutionary significance of favourable mutations to the reader's judgment. The disturbing discovery of Powers [XXVI, 2911] that the same population may require different scaling transformations in successive years to eliminate the effects of epistasis is alluded to though not probed. An unexpected omission is the problem of estimation of the number of effective factors in quantitative inheritance which has provided mathematical genetics with some of its biggest fiascos.

The bibliographies at the end of each chapter are a valuable feature; they would perhaps have been more useful if they had been collected together at the end of the volume.

2418 SHIBUYA, R.

Intercrossing among pink calla, white-spotted calla and yellow calla.

Kasai Publishing & Printing Co., Tokyo 1956 : Pp. 57 + iii : figs. : tables : plates.

This attractive book comprises an account of interspecific hybridization carried out by the author in California since 1946 among *Zantedeschia rehmanii*, with pink flowers, *Z. albomaculata*, with white spotted flowers, and *Z. elliottiana*, with yellow flowers, followed by details of segregation for various morphological characters among the progeny and a discussion of the genetical control of flower colour. A series of colour plates painted by S. Nishiura shows the range of variation of flower colour found in the F_2 and F_3, a range almost as wide as that shown by modern tulip varieties. From the segregation data so far obtained the author tentatively concludes that anthocyanin colour is under the control of four complementary dominant genes, designated A, B, C and D, and that yellow colour is controlled by duplicate genes, Y_1, and Y_2, and a pair of complementary genes, Ia and Ib, which suppress the expression of yellow colour caused by Y_1 and Y_2. Separate gene systems for the control of pink and yellow colour allow of the wide range of variation observed in the hybrids. The text is printed in both English and Japanese, the former on the left-hand page with the latter facing it, and 21 pages of excellent photographs show the habit, leaf shape, leaf markings and corms of a number of the hybrids.

2419 DANSEREAU, P.

Biogeography. An ecological perspective.

The Ronald Press Co., New York 1957 : $12.50 : Pp. xiii + 394 : figs. : tables.

The objective of this volume is to provide senior and graduate students with a synthesis of the environmental relationships of living organisms. The first chapter analyses the different types of distribution that are known for different taxa, with all degrees from universality to the narrow endemism of a family such as the Restionaceae; the ways in which the present distributions are arrived at and various criteria of the centre of origin of a genus are examined and illustrated by examples from Canada and Brazil. The operation of the various factors which determine distribution patterns in different plants are examined in chapters on climate and synecology respectively; much emphasis is placed on the holocenotic nature of environment: "Although some feature may assume control of the habitat and may strongly affect certain species, it always operates in conjunction with all other elements present". In the chapter on autecology a study is made of the many ways in which species exhibit adaptations to particular habitats; in addition to vigour and vitality (defined according to Braun-Blanquet), fecundity is included in the factors that affect distribution, reference being made to the survival of the black maple (*Acer saccharophorum* ssp. *nigrum*) in certain areas by introgression with the sugar maple and of the sugar maple in others by introgression with the black. It is emphasized that the morphology and the environment cannot safely be deduced from each other and must be studied and defined separately and examples are given both of species in which differences in ecological adaptation are accompanied by morphological changes and of those in which it is not; also of unrelated plants that show the same type of adaptation. Various forms of biotic interrelationship such as parasitism and symbiosis are also classified, as are the factors that influence the interrelationships. By compounding all the known adaptive features of a plant or animal, some estimate of its present biological potential may be drawn. This is referred to as the evolutionary opportunity, the elements used in its calculation being range, fidelity, constancy, coverage, sociability and vitality. A table gives the values for area, ecological amplitude, serial position, relative constancy and abundance for eight plant species in eastern North America, which are then taken as types, starting with *Orchis spectabilis*, a very rare species even in the communities that offer it optimum conditions, and ending with *Acer saccharophorum*, referred to as a climax tree throughout its range, which coincides almost completely with the deciduous forest area. This last species is described as having probably evolved by "a repeated, and often precarious oscillation between differentiation (and its attendant losses) and ever higher efficiency".

In chapter 5 the impact of man on the origin and differentiation of life forms is considered under two aspects: the elaboration of new ecosystems and the deliberate moulding of evolutionary forces by the elaboration of new genotypes. Finally a brief reference is made to conservation. The volume is provided with a glossary, a bibliography, a name index and a subject index. The whole approach seems to be more an attempt to classify and name the processes that affect the origin, distribution, adaptation and association of plants and animals, rather than to give a real insight into the processes themselves. The student may therefore find much of his energy directed to understanding the designations of many of the phenomena described, and rather than understanding their operation be immersed in a mass of classical roots and, so to speak, not see the wood for the forest of pogonochores, pterochores, stenovalents, tropophytia and the like. There are also certain inaccuracies of grammar and orthography: *Sansevieria* for instance appears throughout as *Sansieveria*.

2420 **Catalogue of Lewis's medical, scientific and technical lending library.**
H. K. Lewis & Co. Ltd., London 1957 :
New Ed. : £2 2s. : Pp. xii + 1178.

The new edition of the useful catalogue to this long-established library, which is intended mainly for the medical profession and industrial research workers, contains about 28,000 titles [cf. XXI, p. 712]. Counting the large number of duplicates of all the more frequently required works, the number of volumes in circulation and in the library is now over 100,000. The catalogue consists of Part I, providing an alphabetical list of authors and titles, and Part II, giving a classified index of subjects, together with the names of the authors who have written upon them. A list of the annuals and reports is included and information on the working of the library and the service to borrowing members are also given.

2421 NORMAN, A. G. (Editor)
Advances in agronomy. Volume IX.
Academic Press Inc., New York 1957 :
Pp. xi + 308 : figs. : tables.

The 1957 issue reviews some agronomic problems of the Old Cotton Belt of the southern United States [XXVII, p. 156]. Crop breeders will be particularly interested in the contribution on the lespedezas, comprising three parts: I, The origin, history, and development of lespedeza in the United States, by P. R. Henson; II, Culture and utilization, J. D. Baldridge; and III, Lespedeza breeding and improvement, W. A. Cope. The third part provides a useful survey of the following: introductions and varieties; mode of reproduction and crossing technique; breeding and genetics in *L. stipulacea* and *L. cuneata*; interspecific hybridization; and induced polyploidy. The other contributions comprise: Agricultural trends in the Old Cotton Belt, R. W. Pearson and J. H. Yeager; Zinc deficiency and its control, W. Thorne; Defoliation and desiccation: harvest-aid practices, F. T. Addicott and R. S. Lynch; The fixation of phosphorus by soils, J. B. Hemwall; Measurement of soil bulk density and penetrability: a review of methods, J. A. Vomocil; The contributions of statistics to agronomy by O. Kempthorne, in which a short section on the applications of statistics to plant breeding is included; The residual effect of fertilizer, R. L. Cook and J. F. Davis; and The concept of Braunerde (Brown Forest soil) in Europe and the United States, R. Tavernier and G. D. Smith.

2422 SINGLETON, W. R.
Nuclear radiation in food and agriculture.
D. Van Nostrand Company, Inc., Princeton, New Jersey 1958 : 64s. : Pp. xii + 379 :
figs. : tables.

This is the sixth and final volume of the Geneva Series on the Peaceful Uses of Atomic Energy, based on the proceedings of the international conference on this topic held by the United Nations in 1955 [cf. XXVII, 3751–9]. The subject matter covered is thus much the same as that of the more popular Atomic Energy in Agriculture previously reviewed [cf. 1069] but the treatment is more detailed since each chapter consists of a conference paper quoted more or less *verbatim*. One had hoped for some comment and discussion but none is to be found and it seems that the book is no more and no less than it claims to be: "the key papers, suitably edited to eliminate duplication and secondary material, and arranged in a logical manner." However the information is rather more easily accessible than it was in the original conference report and the book is pleasing to handle and well indexed.

2423 Hayes, H. K. & Immer, F. R.
I nuovi metodi per la selezione delle piante. (**Modern methods of plant breeding**).
Longanesi & C., Milan 1954 : L.it. 4000 : Pp. 643 : 16 figs. : 89 + VI tables : 24 plates.

Nothing but praise can be offered to the editors who have shown the enterprise to publish an Italian translation of this deservedly well-known text book on plant breeding. It is only regrettable that they should have chosen to translate the first edition [XIII, p. 95] rather than the much improved second edition which appeared three years ago [XXV, p. 635].

In making the translation, which flows easily and smoothly, no attempt has been made to transmit the statements of the authors literally or even, sometimes, exactly. The confusion between a plant breeder and a farmer occasionally makes the ideas obscure; it has also not always been clear to the translator when the expression small grains referred to size of grain and when to type of cereal. Some statements have been changed completely, without seriously affecting the argument, as in describing the procedure to be followed in selecting parent material on p. 153 of the translation. Other departures from the original affect the meaning more seriously, as in the substitution of "preliminary" for "primary", "hereditary" for "simply inherited", "crossing over" for "crossing", "many" for "replicated", "diffusion" for "running out", "at least" for "as many as", "obtain" for "maintain", "peas and beans" for "pea-bean" and many similar cases. Inversion of the order of words sometimes plays havoc with the logical sequence of the ideas and occasionally results in the inversion of the sense too, as in references on p. 54 to the genetic basis of differences in behaviour of different oat crosses. On p. 63 deviations from 3 : 1 are said to be "uncommon" whereas the English text has them as "fairly common"; "crossed" appears for "inbred" on p. 88, "recessive" for "non-defective" on p. 131, and there are many similar deviations. In other cases the sense has been changed—sometimes into nonsense—by ignoring the grammatical construction of the original, as in the explanation of heterosis on p. 93, and the remark about superior parents on p. 164. Thus a careful reader may find himself mystified by some of the statements as they appear in the Italian text. Most will however be undoubtedly grateful to the publisher for making a translation available to them at all. There are a few misprints such as *Solanum melonigera* for *melongena*, sominanza for dominanza, Münchberg for Müncheberg and so on, but the printing is on the whole accurate and the binding and general presentation attractive.

2424 Cross, W. E.
La Estación Experimental Agrícola de Tucumán de 1914 a 1946. Trabajos e informes publicados. (**The Tucumán Agricultural Experimental Station from 1914 to 1946. Published papers and reports**).
Salvat Editores, SA 1952 : Pp. xxiv + 714 : plates.

The above station is well known for its work on sugar cane, forage crops and fruits. In addition to work in these branches, the station has carried out researches on numerous other crops, on soils, plant protection and on other projects, has acted as an advisory and information service and undertakes seed production and distribution. The results of its activities have appeared in papers in the *Revista Industrial y Agrícola de Tucumán* and other series published by the station. Dr. Cross, during his lengthy tenure of the directorship from 1914 to 1946, wrote numerous and detailed accounts of the work in progress and it is summaries of these papers that form the basis of the present volume. Preceded by a survey of the founding and history of the station, the summaries are grouped under subject headings and arranged chronologically with each group. They provide a valuable and comprehensive guide to the extensive work conducted at Tucumán during this period. An appendix listing the papers published by other members of the staff over the same period and a subject index are included.

2425 **International code of nomenclature for cultivated plants.**
International Union of Biological Sciences, Utrecht 1958 : Pp. 28.

With the publication of the above code, the second edition, the resolution of the many problems surrounding the nomenclature of cultivated plants advances a stage further. The first edition [XXIV, p. 142] was published in 1953. The present edition has been revised by a commission set up under the auspices of the Division of Botany of the International Union of Biological Sciences and with equal representation of agriculture, horticulture and forestry. It is similar in its fundamental provisions to its predecessor but the arrangement has been improved and the text shortened.

Perhaps the most important modification is the recognition of cultivar descriptions in any language instead of an unrealistic insistence on languages using Roman characters as in the first edition.

It is a tribute to the members of the revising commission that so many conflicting points of view have been harmonized. It is possible however that the necessity for securing agreement in committee has been responsible for some examples of poor drafting, notably in Art. 15, which unwittingly excludes a number of vernacular names in Romance languages, in Art. 21, which gives a number of criteria rendering a cultivar name inadmissible but fails to indicate (1) which forms of address are confusing, (2) when a name is too long, (3) what is an exaggeration, (4) how precise a designation should be, (5) how similar two names must be in order to give rise to confusion, and takes the extreme step of disallowing several (? how many) varieties of the same crop to share the same initial word, and in Art. 36, which canonizes the first translation or transliteration of a varietal name into any foreign language, irrespective of linguistic merits. In the first edition, proposals of this sort were recommendations only. It would have been better had this course been adhered to in the present edition.

2426 ŽUKOVSKIJ, P. M. (Editor)
(Wheat in the USSR).
Gosudarstvennoe Izdatel’stvo sel’skohozjajstvennoj Literatury, Moskva-Leningrad 1957 : 16 r. 35 k. : Pp. 632 : 138 figs. : 192 tables. [Russian].

This monograph was compiled to celebrate the achievements in science and agriculture during the first 40 years of Soviet rule.

The introductory chapters give the extent of wheat cultivation in the different parts of the Soviet Union, the yields obtained and the varieties grown. Of the 162 approved varieties of winter wheat, 111 are varieties bred by Soviet breeders, 49 are old local wheats and two are introduced from abroad; of the 152 spring wheats 114 are varieties bred by Soviet breeders, 32 are local wheats and 6 are introductions. Many of these wheats are distinguished by high baking quality and some of them, such as Krymka, have served as parents in breeding high-quality wheats in N. America, Argentina and elsewhere. The high quality of some of the Soviet varieties of *Triticum durum* for macaroni products is also mentioned; in certain places, particularly mountain districts, *T. dicoccum* is valued for making gruel. In the chapter on the history of wheat, recent data are cited showing that wheat was cultivated over 6500 years ago in Iraq, 5000–6000 years ago in Egypt and Asia Minor and 3000 years ago in China. The oldest wheat remains in the Soviet territories are those of Turkmenia, dating from the 5th century BC and pertaining to *T. dicoccum*; it was sometimes, as happens in certain areas even today, accompanied by *T. monococcum.* On the other hand there is no record of *T. timopheevi* before the 7th century AD. *T. durum* appears in remains from Iraq and Palestine dating from 3200 BC; it was also cultivated in what is now the Hmel’nickaja province of the USSR in the 4th century BC. *T. turgidum* was found in the Swiss lake dwellings of the 3rd century BC and *T. compactum* has been found in remains of the same date in Armenia and Nahičevan. *T. aestivum* appears in remains dating from the 4th century BC in Turkmenia and from the 3rd century BC in Transcaucasia and the Ukraine; *T. carthlicum* is found from the 2nd century BC. There is evidence that wheat was brought from Russia to Greece, via Thessaly, in about 2600 BC; it was also brought to Transcaucasia, Siberia and elsewhere by Russian settlers. A long list of Russian varieties that have been used as parents in breeding work in other countries is presented and certain introduced varieties that have been used in breeding in the Soviet Union are mentioned.

A chapter is devoted to the systematics of the genus *Triticum*, the species in the different chromosome groups being illustrated and described, with indications of areas where some of them are to be found today in cultivation in the Soviet Union and elsewhere; the descriptions include certain species not found outside the USSR, namely the cultivated wheats *T. timopheevi*, *T. paleao-colchicum* and *T. macha*, and the wild species *T. araraticum* (= *T. chaldicum*) and *T. urartu*. The Chinese wheat *T. amplissifolium* is now regarded as a subspecies of *T. aestivum.* Various amphidiploid combinations with 56 and 70 somatic chromosomes, which have been classed as new species, are also mentioned. Within the main species, particularly *T. aestivum* and *T. durum*, a number of ecological groups are distinguished and some cultivars representative of each are cited and illustrated. Full details are given concerning branched wheats, references to them in Roman times, in 1536 in France and in 1794 in Russia being cited; mention is made of their frequent occurrence in wheat populations at the present time in Transcaucasia and of various attempts to cultivate them in the past. The forms of branched *T. turgidum* that have been tested in Leningrad have proved more disease resistant than the bread wheats, some of them being highly resistant to smuts but not to yellow rust, drought, frost or the majority of insect pests; they are free from lodging and shedding and from sprouting; in number of fertile tillers, size of grain and protein content they are inferior to *T. durum.* Several other species are referred to in which branched ears have been observed. The diversity of types in the wheats of Transcaucasia is particularly great and detailed descriptions are given of the forms that occur in that area. Many of them are of value for plant breeding; thus *T. timopheevi* is resistant to almost all fungus diseases; *T. palaeo-colchicum* is resistant to rusts, smuts and drought; *T. dicoccum* has standing capacity and tolerance, especially of high altitudes; *T. carthlicum* is tolerant of low temperatures during the growing season, high altitudes and excessive moisture, combined with freedom from sprouting and lodging and resistance to yellow and brown rusts, loose smut, mildew and *Fusarium*; it has been successfully crossed with *T. durum*; this latter species is of interest for its resistance to yellow rust and its response to irrigation; *T. turgidum* is represented by a group distinguished by tolerance of high temperatures and very low air humidity; some branched forms are cultivated at altitudes of 1200 m.; *T. macha* exists in two distinct forms, which have even been regarded as distinct species, *T. tubalicum* and *T. imereticum*; most of them cross with both *T. aestivum* and the *T. durum* group, though *T. tubalicum* var. *letschumicum* will not cross with *T. aestivum*; they are thought to be of interest for producing wheats tolerant of warm humid conditions; two ecotypes of *T. compactum* exist, adapted to high altitudes with cool humid and warm humid climates respectively; eight ecotypes of *T. aestivum* are described, some of them distinguished by rust resistance, others by standing, yielding or tillering capacity, or tolerance of drought, high temperature, cold or high altitudes.

The various biological features of the wheat plant dealt with include germination, formation of root and stem, flowering, grain maturity, phasic development, soil and water requirements and reaction to cold, drought and other adversities; some useful data are given showing the dates at which the main events in the life cycle are accomplished in different localities in the Soviet Union. Separate chapters deal with biochemistry and with breeding. The main problems facing wheat breeders in different parts of the Soviet Union are outlined. The importance of local varieties as sources of ecologically adapted material is emphasized; they are also characterized by good grain quality and have served as the starting point for breeding many of the best present-day varieties both in Russia and elsewhere. This fact is used to illustrate the importance of the world collection of wheats at Leningrad, about half of which consists of wheats collected in different parts of the Soviet Union; some of the successful varieties derived from them are enumerated; thus Marquis, Prelude, Lutescens 62 and Odessa 3 are all famous wheats derived from local races from the Ukraine; Kanred and its descendants are derived from the Crimean wheat Krymka and have in turn been used as parents in breeding Soviet wheats, such as Kuban' 122 and 131, Hybrid 481, Vargisi, Alma-Ata, Skorospelka 3 [Early 3] and Jubilejnaja Osetii [Osetian Jubilee]. Collections made in Asia Minor and the Near East and in various Mediterranean countries have also served as parents for successful Soviet varieties, several of which are mentioned. Many of these are forms of *T. durum*; for *T. aestivum* some of the most useful introductions have been from China; a wheat from Kashmir has given rise to the variety Erythrospermum 22277 and several have been derived from Banat, Sandomirka and other wheats from Central Europe; other Soviet varieties have arisen from introductions from Australia, South Africa, South America, Canada and the USA. Quite a number of the varieties moreover have arisen from crosses with other species and all this is taken as an illustration of the value of crossing parents of widely different origin or ecological type. Lysenko's method of choosing parents according to their phasic development is expounded and illustrated by the production of the varieties Lutescens 1163 and Odessa 13. In making crosses, the use of a locally adapted form as seed parent is recommended and the value of using several pollinating varieties, to take advantage of selective fertilization, is explained. In breeding for rust resistance it is desirable to take one parent that is resistant in the early growth phases and the other that is resistant at later stages and in breeding for yield to choose parents which contribute yield components of a complementary nature, such as grain number and 1000 grain weight. Various instances of differences in the behaviour of reciprocal hybrids, especially in wide crosses, are cited. Examples are given of successful varieties that have arisen from crosses of *T. aestivum* x *T. durum*, which include Sarrubra, stated to be one of the best wheats in the world in baking quality, and Candicans 76/10, an awnless *T. durum*. A rust-resistant variety of

T. durum has been obtained from crosses involving *T. timopheevi* and *T. carthlicum*. The first wheat x rye hybrid, 46/131, was approved in 1931 and is characterized by winter hardiness and good baking quality. Reference is also made to the hybrids of *Triticum* x *Agropyron* produced by Cicin [XXIII, 2560].

The technique of endosperm grafting is described and several varieties produced by its use are mentioned. The chapter on breeding ends with an account of the different methods of selection and of some varieties that have been produced by its means; the importance of performing the selection under the precise conditions for which the variety is designed is emphasized, and the main characters for which selection is carried out in the USSR are listed.

An account is given of the methods of seed production used in the USSR and there follows a chapter devoted to descriptions, with illustrations, of the wheat varieties grown in the main geographical zones of the Soviet Union, indications being given of the origin, the chief characteristics, the date of release and the area for which each is suitable. Further chapters describe the various insect pests and fungous diseases that attack wheat in the USSR, with some suggestions for methods of control. One of these methods is the creation of resistant varieties; brief descriptions are given of the resistant species *T. timopheevi* and *T. carthlicum*, of the artificial hybrids *T. fungicidum* and *Haynatricum* and of some promising crosses made with them [cf. 1539].

The remainder of the volume is taken up with the methods of cultivation of winter and spring wheats in different parts of the Soviet Union.

2427 SPRAGUE, G. F.
(Corn and corn improvement).
Izdatel'stvo inostrannoj Literatury, Moskva 1957 : Pp. 557 : 181 figs. : 49 tables. [Russian].

A Russian translation appears of the volume published in 1955 [cf. XXVII, p. 164]. In an introductory note P. M. Žukovskij refers to the important contribution made to the economy of the USA by hybrid maize and mentions some early work done on these lines in the USSR, including the discovery of male sterility in 1931. Some 10 interline hybrids are now approved for cultivation in the USSR. Six-seven generations of inbreeding are considered sufficient and since two generations of inbreds a year can be grown, new lines should now be produced in 3–3½ years. Attention is called to the importance of the collections made by botanists in the USA of the local maize types of Latin America and to the need for Soviet breeders to find lines that react favourably to the long photoperiods of northern Russia; also to the desirability of finding a simpler method of testing combining ability.

The translation is straightforward and accurate and even corrects certain slight inaccuracies that exist in the original text. The tables and figures have been numbered serially through the volume, the quality of the illustrations having suffered considerably in the reproduction.

2428 WHEELER, W. A. & HILL, D. D.
Grassland seeds.
D. Van Nostrand Co., Inc., Princeton, New Jersey 1957 : 94s. : Pp. xx + 734 : figs. : tables : plates.

Intended for seed growers, processors and dealers in the United States, as well as for students, teachers and extension workers, this book provides information on all aspects of the production and marketing of the seeds of forage grasses and legumes. The authors, together with the other specialists who have contributed certain of the chapters, may be congratulated upon producing a most comprehensive and clearly-written reference work. Part I, dealing with general aspects, contains a chapter on each of the following topics: grassland seeds—the key to a permanent agriculture; seed formation and germination; the importance of using high-quality seed in order to obtain good stands; seed testing; insect pollination of legumes; insects injurious to forage seeds; disease problems in forage-seed production and distribution; treatment of seeds for disease control; legume seed inoculation; cultivation for seed; harvesting and threshing; processing; drying and storage; certification and the foundation seed programme; marketing; international trade; estimation of seed crops; and the evolution of the industry. Part II is concerned with individual crops, guidance being given on utilization, seed characteristics, varieties, management, harvesting, threshing and cleaning. Statistics of production during recent years are also included. Part III is an appendix, containing a glossary of terms and information on such miscellaneous matters as the trade rules of the American Seed Trade Association, seed-cleaning machines and the policies of the Seed Improvement Committee of this association with regard to future developments of the industry. Good drawings and photographs and a reliable index raise the book to a high level of usefulness.

2429 Brown, H. B. & Ware, J. O.
Cotton.
McGraw-Hill Book Co., Inc., New York, Toronto & London 1958 : 3rd Ed. : 93s. : Pp. xi + 566 : 145 figs. : 75 tables.

First published in 1926, this well-known textbook on all aspects of cotton production, chiefly in the United States, appeared in its second edition in 1938 [IX, p. 148]. The present edition incorporates information on advances which have been achieved during the last two decades in such fields as mechanization of cultivation and harvesting, varietal improvements in yield and quality, methods of ginning, marketing procedures and utilization of both the lint and seed. The revision has been made by the junior author, with the help of a number of other specialists. The general plan has been retained but the book has been largely rewritten, except in a few chapters in which considerable use has been made of the old material. The majority of the illustrations are new.

2430 Gangolly, S. R., Singh, R., Katyal, S. L. & Singh, D.
The mango.
Indian Council of Agricultural Research, New Delhi 1957 : 85s. : Pp. xiii + 530 : 288 plates : tables.

This beautiful book has been produced by the Indian Council of Agricultural Research to fill the need for a classification of mango varieties, with standardized nomenclature and descriptions. Work was begun in 1948, and the book contains descriptions of 210 varieties, including all those of commercial importance, giving the characteristics of the tree, the leaves, the inflorescence and the fruit and stone and describing the different aspects of fruit quality. Where known the origin of the variety and its synonymy are included. Each is illustrated by a tempting colour plate of the ripe fruit, presumably life size, which would be even better if the paper used had been a little thicker, so that the plate on the reverse side did not show through. The descriptions are preceded by a short chapter on the known history of the fruit in India, a second on the morphology and cytogenetics of the mango and a third explaining the terms used in the descriptions. The second part of the book consists of two chapters on mango culture, covering cultivation and insect pests and diseases and their control. Two appendices, listing varieties for different purposes and tabulating the quantitative characters of the varieties, a bibliography comprising 162 references and subject and variety indexes complete the book. Some confusion may result from the fact that the study was completed before the reorganization of states in India and references to places of origin and distribution are thus, unfortunately, already out of date. Apart from this minor flaw the book will undoubtedly be welcomed by all interested in the advancement of Indian horticulture in general and in mango improvement in particular.

2431 Leemans, J. A. & Nannenga, E. T.
A morphological classification of raspberry varieties.
Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen. 1957 : Pp. 140 : figs.

A total of 53 varieties is described and illustrated here, many of which are commonly grown in the Netherlands. The plants described are maintained in a collection on sandy soil at Wageningen and on clay soil at Kesteren. The characters emphasized in the description are discussed and a key is included together with a bibliography comprising 100 references.

Hudson, J. P.
Control of the plant environment.
Butterworths Scientific Publications, London & Academic Press Inc., New York 1957 : 42s. : Pp. xvi + 240 : figs. : tables.

The success of Dr. F. W. Went at the Earhart Plant Research Laboratory in the USA has stimulated interest in the growth of plants under controlled environments in a number of countries. The discussions at the Fourth Easter School in Agricultural Science [cf. XXVII, p. 392] at the University of Nottingham, Great Britain, in April 1957, which was devoted to the subject in its many aspects, seemed to show that a stage has been reached where collaboration between the geneticist and physiologist would be to their mutual advantage. The proceedings of the meeting, which are embodied in this volume, will therefore be read with interest by most plant breeders. Some of the contributions deal directly with these aspects and are considered below; most of those not dealt with are however of indirect interest and can be read with advantage by all those interested in plant genetics either in its application to the improvement of agricultural crops or in its wider bearing upon biological phenomena as a whole.

2432 *Wellensiek, S. J. The plant and its environment. (pp. 3–15).*

In a review of the influence of temperature, light and humidity on plant development it is shown that diurnal thermoperiodicity though widespread among plants is not general, some plants such as *Arachis* giving the best growth when day and night temperatures are the same; it has even been shown that different cultivars of the same species may have different requirements. Diurnal periodicity in water requirements has also been demonstrated.

2433 *Wassink, E. C. The study of plant growth in controlled environments.* (*pp. 36–57*).

It is shown how, without the use of the elaborate and often excessively rigid conditions of the phytotron, the use of a controlled environment may contribute to the study of various aspects of plant growth. Among the results described are those from an experiment with reduced photoperiods applied to pine seedlings; in those of French provenance root and shoot development were quite good in a photoperiod of 12 hr. whereas seedlings from a latitude of 66° in Sweden grew successfully only in long days.

2434 *Thomas, P. T. Controlled environments in the study of plant genetics.* (*pp. 58–71*).

The subject is illustrated by a number of examples. For instance, genetically early peas have been shown to be nonphotoperiodic whereas late varieties are long-day plants with pronounced vernalization requirements, which vary from cultivar to cultivar; the response of the late type is dominant in inheritance, with monogenic ratios, upon which a polygenic system controlling some other physiological reaction affecting flowering is superimposed. Controlled temperatures have assisted in studies of the growth rates of compatible and incompatible pollen tubes and controlled light and temperature in studies of ecotypes in populations of *Lolium* from different geographical areas [cf. XXV, 320]. The use of controlled conditions in studies of heterosis [cf. XXVI, 39] and of nuclear behaviour are also referred to, together with unpublished data concerning experiments in which it has been possible by certain environmental influences to produce a number of environmentally conditioned types of a single flax variety; these differences, which may be of the order of 300% in respect of plant weight at maturity, are transmitted to subsequent generations and are ascribed to cytoplasmic effects.

2435 *Lawrence, W. J. C. The glasshouse as an environment for plant experiments.* (*pp. 129–38*).

The view is presented that "as much thought should be given to the design of glasshouses and the control of the glasshouse environment as is given to the planning of the experiments to be carried out in them". Some useful practical advice is given as to how to achieve this in respect of light and air temperature.

2436 *Hudson, J. P. General aspects of environmental control.* (*pp. 159–70*).

An outline is given of the types of problem in which controlled environmental conditions are desirable and of the most efficient means of attaining the degree of control required. The first item dealt with is the production of uniform plant material for physiological or genetical studies, others being the reproduction of seasonal conditions, adjusting growth rates or development, and studying the response of plants and cultivars to weather conditions. The advantages of various types of installation for these different purposes are examined.

2437 *Berrie, A. M. M. Two phytotrons.* (*pp. 171–79*).

Some impressions are given of the phytotrons at the Earhart Laboratory, USA, Liège in Belgium and Wageningen in the Netherlands.

2438 *Thomas, P. T. Three growth rooms for genetical work.* (*p. 181*).

The three rooms comprising the unit at the University College of Wales, Aberystwyth, are described.

2439 *Lawrence, W. J. C. The John Innes multi-purpose growth rooms.* (*pp. 181–83*).

The new mutli-purpose rooms at the John Innes Horticultural Institution at Bayfordbury, England, are described and some questions concerning detail that arose in the discussion are answered.

2440 *Bleasdale, J. K. A. National Vegetable Research Station daylength cover.* (*p. 195*).

As a contribution to the section devoted to growth cabinets, which are smaller and more modest structures than growth rooms, a box with a time switch which controls the opening and closing of the lid for photoperiodic experiments is described.

2441 WENT, F. W.
The experimental control of plant growth.
Chronica Botanica Co., Waltham, Mass., USA & The Ronald Press Co., New York
1957 : **17** : $8.50 : Pp. xvii + 343 : 71 figs. : 21 tables : 25 plates.

Just twenty years ago, in 1938, the first air-conditioned greenhouse was constructed by the California Institute of Technology; ten years later the Earhart Plant Research Laboratory was designed, and completed the following year. Today the name phytotron, used to designate such installations, is a household word among botanists and even agriculturists have come to know of it. A book by Professor F. W. Went, the prime mover in this new development in research on plant behaviour, in conjunction with some collaborators, will be welcomed by plant physiologists, plant geneticists, plant breeders and in fact anyone who has to do with growing plants. The first part gives full details of the construction and operation of the Earhart laboratory, the second deals with the climatic response of individual plants. In the last fifteen years some 150 different kinds of plant have been investigated, a number of them being of economic importance, potentially or actually. Many plants have been grown under completely controlled conditions to study their phenotypic and genotypic variability, others for the study of their ecotypes. The first set of experiments described comprises those on the tomato; from the many data presented we select some of genetical interest: varieties differed in the optimum day and night temperatures, some doing best at a day temperature of 23° C. combined with a night temperature of 12° C., others with 20°–14° C.; the range of temperatures beyond which fruiting failed altogether also differed according to variety. Red peppers show responses similar to those of tomatoes; experiments with potatoes were carried out with the variety Kennebec only but they showed that this variety at least does not exhibit a short-day reaction except when grown at night temperatures above 14° C. Varietal differences were observed in tobacco in respect of response to night temperatures.

In peas, 4–6 generations a year can be obtained in the laboratory and because of this and the ease with which they can be grown to phenotypic uniformity they are being used for studies on quantitative inheritance and on the genetics of physiological responses. Depending on the variety, the lowest node at which a flower forms is 9 or higher. The varieties which do not flower below the 15th node are usually long-day plants and are vernalizable. In some varieties such as Unica full vernalization lowers the first flowering node from the 18th to the 14th, in other varieties the difference may be only 3 nodes. Pea and bean (*Vicia faba*) varieties share the capacity to grow at relatively low day temperatures; most varieties, with the exception of the very early-flowering ones, behave as long-day plants.

In the strawberry varieties investigated the expected short-day reaction was not found at low temperatures; in general the lower the temperature the higher the light intensity had to be to suppress flower initiation but the actual values for photoperiod, light intensity and temperature also differed according to variety.

In a chapter on grasses, W. M. Hiesey points to the confusion that exists regarding the interaction between genetic and physiological processes and suggests that this might be clarified by experiments under strictly controlled conditions. A brief review is given of some of the published data on the different responses of species, races, ecotypes and their hybrids to particular conditions of temperature and photoperiod [cf. X, 17, XV, 642, XXV, 320 and XXIII, 2735] and the conclusion is reached that "the complex genetic makeup of most species of plants and their varying responses in differing environments, on one hand, and the as yet unknown chain of developmental processes that takes place within the individual, on the other, suggest the need for increasing precision in the isolation of factors in order to clarify these relationships".

The tree species investigated include *Coffea arabica* 'Bourbon', 'Caturra', 'Mundo Novo' and 'Semperflorens'; the last-named initiates flowers even in a photoperiod of 16 hr. and seems to be photoperiodically indeterminate. In the experiments on cold requirements in peach seedlings it is surprising to find no reference to the varying requirements of different cultivars.

Part III is a general discussion and starts with an examination of the question of genotypic and phenotypic variability. The experiments in the Earhart laboratory have shown most commercially available strains of pea, tomato, tobacco and many other predominantly self-pollinated plants to possess a high degree of genetical uniformity, whereas in plants such as sugar beets the reverse is true. For most experiments the genetic variability is reduced to a minimum and by rigidly controlling the conditions of growth the variability can be reduced to less than half that observed with the same material grown in the field or in an ordinary greenhouse. In this way, we are told, the number of plants per treatment can be reduced to about four, thus simplifying—or almost excluding the need for—statistical treatment and very much reducing the space and time required for any one experiment. An account is presented of studies on plant growth made on such highly uniform material; in addition to the usual long-day, short-day and day-neutral plants, two further categories of ambiperiodic and indeterminate are established.

In a general way it is found that closely related plants are affected by the same climatic variables, the Solanaceae, for instance, responding primarily to night temperature, the Papilionaceae to day temperature; the Liliaceae and most deciduous trees require a seasonal periodicity of temperatures and so on. Differences between genera, species, cultivars or ecotypes are usually quantitative rather than qualitative in nature; in some plants the range in these quantities is extreme, as in *Achillea*, whose races respond to the night temperatures characteristic of localities ranging from sea level to altitudes of 3000 m. The optimal night temperatures for fruiting in tomatoes however vary only from 14° to 18° C., though some varieties such as Bounty have a wide range of tolerance. Indeed, most species have a relatively narrow range, the optimal night temperatures for potatoes being in the region of 12° C. and that for peppers being still lower, and the range for the three plants does not overlap. The range for each plant studied is roughly the same as that of the climate in its natural habitat and has been very little changed even by intensive breeding. It seems that photoperiodic response is more easily changed in the course of evolution and the parallelism is not so close; differences of a qualitative nature may even occur within a genus, e.g. *Nicotiana*, where long-day, indeterminate and short-day types are found.

Various attempts that have been made to classify climates and their influence on plant distribution are examined, particularly in the light of the importance of night temperatures as well as day temperatures in regulating plant development as it has emerged from the experiments in controlled environment; an example is given showing how a difference of 3° C. in the optimum night temperature could effect a complete separation of two tomato races after 4–10 years when they are sown in two localities differing by 3° C. in mean night temperature. With a difference of 1° C. the separation would be expected after about 1000 years.

Chilling requirements too have a marked effect on distribution: *Veratrum californicum* grows only in areas with a temperature close to zero for almost six months of the year, whereas *V. fimbriatum* requires chilling for only two months. Again in references to the chilling requirements of peaches and sugar beet there is no mention of the differences between cultivars which are known to exist in this respect.

Another factor influencing the distribution of plants is their germination habit, and many peculiar phenomena, most of which serve to prevent germination under unfavourable circumstances, are mentioned. Other factors are the ability to absorb water through the leaves, photoperiod and critical light intensities. In some species the conditions under which the seedlings will survive limit distribution, in others the limiting factors are those affecting the mature plant.

In his conclusions Dr. Went remarks that "the great development of statistics and its extensive use in the botanical sciences may to some extent have blinded us to the simple truth that there is no substitute for a properly executed experiment, and that a proper experiment is one in which all variables are known and controlled." In the experiments here described he has gone a long way towards reaching this high ideal. "It is difficult", he writes, "to find any arguments to justify the construction of the conventional style of research greenhouses, and only conservatism, and lack of experience among greenhouse builders, or absence of electricity, can be an excuse for their continued construction".

2442 Rose, M.
Les caractères des organismes vivants. (**The characters of living organisms**).
Presses Universitaires de France, Paris 1957 : 600 F. : Pp. 199 : 12 figs.

The author of this readable little book is particularly interested in the role played by chemical substances in initiating and organizing the development of living things; examples which illustrate the effect of hormones on morphological development are taken mainly from the animal kingdom. A chapter is devoted to discussions on the influence of external physical and biotic factors on individual development. A popular exposition of the principles of genetics occupies most of the book. Mendelian inheritance and its modifications by linkage, lethal genes, pleiotropy and multiple allelism are explained. Mutations, sex determination, the nature of the gene, cytoplasmic inheritance and the inheritance of acquired characters are also expounded. Conditions intermediate between somatic changes provoked directly by the environment and changes resulting from the spontaneous mutation of genes are mentioned to support the author's view that these phenomena are not entirely distinct.

NEW JOURNALS

***Hodowla Roślin, Aklimatyzacja i Nasiennictwo* (*Plant Breeding, Acclimatization and Seed Production*).**
This journal, a publication of the Polish Institute of Plant Breeding and Acclimatization, made its

first appearance in January-February, 1957. The first issue included reports of work on the transformation of spring wheats into winter wheats and *vice versa* [cf. 1512], smut resistance in maize and quality in oats and potato.

The journal is issued in six numbers a year, price 120 zł. per volume or 25 zł. per number. Further information may be obtained from: Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa, Warecka 11a.

Lucrările Institutului de Cercetări Alimentare.

The above journal, the first volume of which appeared in 1957, is the official publication of the Rumanian Institute for Research on Nutrition. It deals mainly with food processing, including information on the quality of plant products. Rumanian research on tobacco, formerly published in *Buletinul Tutunului*, is also covered by the present journal, and a paper on this crop is abstracted in the present number of *Plant Breeding Abstracts*.

Enquiries should be addressed to Institutul de Cercetări Alimentare, Bucureşti.

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